Bothalia

Price 15s.

A RECORD OF

CONTRIBUTIONS

FROM THE

NATIONAL HERBARIUM

UNION OF SOUTH AFRICA PRETORIA



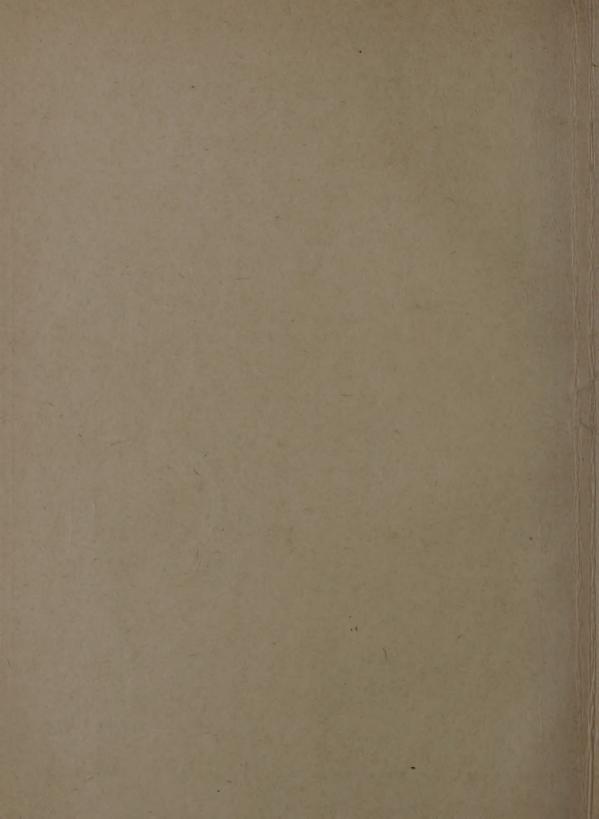
EDITED BY

R. A. DYER, M.Sc., D.Sc., F.R.S.S.Af.,

CHIEF, DIVISION OF BOTANY AND PLANT PATHOLOGY, DEPARTMENT OF AGRICULTURE PRETORIA; AND

DIRECTOR OF THE BOTANICAL SURVEY OF THE UNION OF SOUTH AFRICA

THE GOVERNMENT PRINTER, PRETORIA, 1951



Bothalia

A RECORD OF

CONTRIBUTIONS

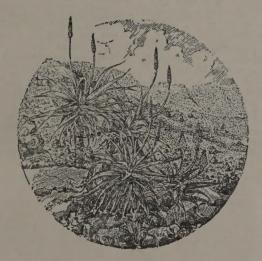
FROM THE

NATIONAL HERBARIUM

UNION OF SOUTH AFRICA

PRETORIA

Vol. VI.



EDITED BY

R. A. DYER, M.Sc., D.Sc., F.R.S.S.Af.,

CHIEF, DIVISION OF BOTANY, DEPARTMENT OF AGRICULTURE, PRETORIA AND DIRECTOR OF THE BOTANICAL SURVEY OF THE UNION OF SOUTH AFRICA

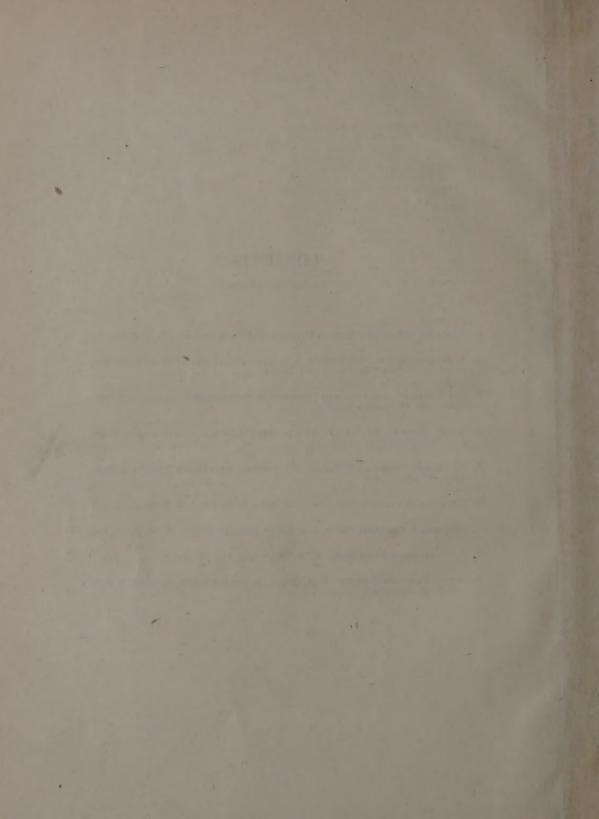
THE GOVERNMENT PRINTER, PRETORIA

CONTENTS.

Part I.	Published 1951.	PAGE		PAGE
Hymen	f Some South African Resupinate omycetes, by P. H. B. Talbot pological, Anatomical and Cyto-	1	Concerning Some South African Pestalo- tiopsis, by R. L. Steyaert	379
logical	Study of Potamophila prehensilis Benth., by B. de Winter	- 117	laria transrugosa Stapf, by J. Slinger The Nomenclature of Species of Allophylus	385
The Taxo	nomy, Anatomy and Cytology of bromus africanus (Hack.) Stapf, by		in South Africa, by B. de Winter The Nomenclature of the Cape Acacia, by	407
South A	Vinter	139	I. C. Verdoorn Newly Described Species, by L. Britten,	409
Verdoo Revision	lar Glutinous Pods, by I. C. rn of the Genus Cyclopia and Notes	153	A. Breuckner, H. B. Christian, R. A. Dyer, M. D. Henderson, D. J. B. Killick, R. Story, I. C. Verdoorn and H. Wild	415
by P. K	ne other Sources of Bush Tea, ies	161	Part III. Published 1956.	
Species.	Asparagus africanus and Related by P. Kies Interesting Records of South	177	Entorrhiza calospora sp. nov., and Some Other Parasitic Fungi in Limeum Roots, by P. H. B. Talbot.	453
African	Fungi, by P. H. B. Talbot	183	The Cyphelloid Fungi of South Africa, by P. H. B. Talbot.	465
I. C. Ve	rtos natalensis, by R. A. Dyer and	205	New and Interesting Records of South	
	scribed Species, by E. A. Bruce, ckner, R. A. Dyer, P. Kies and		African Fungi. Part ii, by P. H. B. Talbot Three Species of <i>Curvularia</i> from <i>Pinus</i> , by	489
	rcoorn	213	G. C. A. van der Westhuizen Notes on Certain South African Erythrina	501
Part II.	Published 1954.		Species, by L. E. Codd	507
Micromor	phology of the Lower Hymeno- by P. H. B. Talbot	249	The Schotia Species of Southern Africa, by L. E. Codd	515
A Note on	Sterigmata in General, by M. A.	301	African Flowering Plants, by E. E. A. Archibald, L. E. Codd, R. A. Dyer,	
The Genu	s Stereum in South Africa, by		A. D. J. Meeuse and D. van Druten	535
On the G	Talbotenus Lopharia Kalchbrenner &	303	The Oleaceae of Southern Africa, by I. C. Verdoorn	549
MacOw Some Gra	an, by P. H. B. Talbot	339	Part IV. Published 1957.	
thosporii	um and Curvularia Occurring in frica, by K. M. Putterill	347	The South African Convolvulaceae, by A. D. J. Meeuse.	641

CONTENTS.

		PAGE.
1.	STUDIES OF SOME SOUTH AFRICAN RESUPINATE HYMENOMYCETES. P. H. B. TALBOT	1
2.	A MORPHOLOGICAL, ANATOMICAL AND CYTOLOGICAL STUDY OF POTAMOPHILA PREHENSILIS, (NEES) BENTH. B. DE WINTER	117
3.	THE TAXONOMY, ANATOMY AND CYTOLOGY OF PSEUDOBROMUS AFRICANUS (HACK.) STAPF.—B. DE WINTER	139
4.	SOUTH AFRICAN SPECIES OF ACACIA WITH GLANDULAR GLUTINOUS PODS, I. C. VERDOORH	153
5.	REVISION OF THE GENUS CYCLOPIA AND NOTES ON SOME OTHER SOURCES OF BUSH TEA. P. KIES	161
6.	Notes on Asparagus africanus and Related Species. P. Kies	177
7.	New and Interesting Records of South African Fungi. P. H. B. Talbot	183
8.	Encephalartos natalensis. R. A. Dyer and I. C. Verdoorn	205
9.	Newly Described Species. E. A. Bruce, A. Brueckner, R. A. Dyer, P. Kies and I. C. Verdoorn	213



Studies of some South African Resupinate Hymenomycetes.*

By P. H. B. Talbot.

Resupinate Hymenomycetes do not form a closely integrated group, and it must be borne in mind that the term "resupinate" is ambiguous, being used both morphologically and as a colloquial name for the large, non-taxonomic group of lower Basidiomycetes whose members are characterised by a fructification lying flat on the substratum with the hymenium on the outer side. While the taxonomic work which follows has been limited to South African species, fungi from other regions are mentioned in comparison.

Collectors in South Africa, with the notable exception of Mr. W. G. Rump of the Natal Museum, have paid little attention to resupinate Basidiomycetes, as the collections cited in the subsequent pages will testify. These fungi are seldom of striking appearance, which may be one reason why they were so poorly represented in the famous early collections. The data in Table I are presented in illustration of this point. The table also summarises the more important early literature references to South African fungi. These records mostly lack descriptions, or if descriptions are given then they are generally totally inadequate by present standards.

TABLE 1.

Table indicating how very few Resupinate Hymenomycetes were listed or described from collections of fungi made by famous early collectors in South Africa.

Collector.	Collections Examined By.	Gross Number of Species in Collection.	Number of Resupinate Hymenomycetes Represented.
Zeyher	Berkeley (1843, a)	31	Nil
Burke and Zeyher	Berkeley (1843, b)	- 2	Nil
Drège	Léveille (1846)	11	Nil
1000	Montagne (1847)	32	3
Wahlberg	Fries (1848)	40	2
MacOwan	de Thümen (1875–78)	127	2
	Kalchbrenner and Cooke (1880)	108	Nil
	Kalchbrenner (1881, a; 1881, b; 1882)	322	14
	Winter (1884–1885)	19	Nil
Eaton	Berkeley (1876)	31	1
J. Medley Wood	Bottomley (1917)	527	5
	Cooke (1879, 1881)	248	Nil
	Kalchbrenner and Cooke (1880)	108	Nil
	Kalchbrenner and Cooke (1881)	39	1
01111	Sydow (1899)	41	Nil
Schlechter	P. Hennings (1895, 1898)	24	Nil

Even in recent years the tendency has been to overlook resupinates. For example, Phillips (1931) lists 127 species of fungi from Knysna forests, of which only two are resupinate Hymenomycetes. None at all are found in Miss Pegler's collection of seventy-nine species from Kentani (Pole Evans and Bottomley, 1917). Miss Wakefield's

^{*} Most of this work was prepared while the author occupied the post of South African Assistant at the Herbarium of the Royal Botanic Gardens, Kew, and he is deeply indebted to the several authorities responsible for this arrangement. At Kew, he was singularly fortunate in receiving the guidance of Miss E. M. Wakefield and Dr. B. Barnes of Chelsea Polytechnic, whose interest and unstinted help is gratefully acknowledged.

examination of Höeg's collections of African fungi resulted in the listing of five resupinates among a total of fifty-five species (Wakefield, 1936). Simpson and Talbot (1946) list only five resupinates out of a total of fifty-four species from Qudeni forest.

Without adequate collections, and facilities for comparison of material with types in overseas herbaria, taxonomic work in this group has never progressed beyond the pioneer works of van der Byl (1929, 1934) where about forty species are described. The present paper is an attempt to extend and modify van der Byl's work on the basis of new collections which have accumulated in the herbaria. However, there are still insufficient good collections of certain species, for this country is strangely lacking in those amateur naturalists on whom so much has depended in other countries for the advance of mycology.

DISTRIBUTION, NATURAL HABITATS, AND SUBSTRATA.

The relative paucity of collections makes it impossible to obtain a clear picture of the distribution of the different species within South Africa, but it is likely that they are widespread throughout all parts of the country where the same type of natural habitat occurs. The physical configuration of the Union is responsible for a great variety of natural habitats and conditions of localised occurrence, only a few of which are suitable for the growth and development of resupinate Hymenomycetes. Undoubtedly the optimum conditions of moisture, temperature and rotting vegetation are found in the indigenous forests and bush, and to a lesser extent in the artificial plantations of *Eucalyptus* spp. or *Acacia mollissima* and *A. decurrens*. In the Thornveld, subjected to periodic hot winds from the north, a limited water supply and recurring grass fires which prevent the tree formation from closing in so that moist, shady conditions do not obtain (Bews, 1912 p. 309; 1913, p. 497), resupinates are rare except near stream banks. The ravages of termites on fallen sticks and branches in the Thornveld without doubt limits the amount of rotting vegetation available for the support of saprophytes.

It is suggested that the same species of fungi are likely to be widespread in scattered indigenous forest formations which owe their existence to the Great Escarpment (A. W. Rogers, 1922) of South Africa. Such forests occur chiefly in the botanical region known as the "Steppe and Forest Province" (Pole Evans, 1922), that is, on the south-east slopes of the escarpment and subsidiary mountains facing moisture-laden winds from the Indian Ocean, and sheltered from the hot north winds. Forest formations dependent in this way on topography are fully discussed by Bews (1912, 1913), Henkel et alia (1936), and Phillips (1931), who conclude that their phanerogamic constitution varies only slightly in different localities. The coastal forests of Natal are closely allied to tropical East African bush (Bews), 1912, while those of Knysna further south (Phillips, 1931) are composed of species derived from tropical ones; they are, however, climatically and constitutionally more temperate in nature than those of Natal, the Eastern Cape and the Transvaal.

Marloth (1903, 1905) has shown how effectively the vegetation is able to precipitate the moisture carried by the S.E. winds at the Cape, in the absence of actual rain. On the other hand, Bayer and Coutts (1938) draw attention to the remarkably frequent occurrence of very low relative humidity in the Thornveld (less than 50 per cent. at midday on 174 days in the year, and as low as 7 per cent. at 8.30 a.m. when the "Berg" winds are blowing); this in itself would almost exclude saprophytic fungi from flourishing in such a habitat at most seasons.

The above ecological evidence supports the suggestion that the same species of resupinate fungi might well be widespread in all natural forests in the Union, and that our fungus flora is likely to include many elements derived from, or at least common to, the more central African territories. Here an analysis of the distribution of forty-five

species, described in this paper, is of interest. The analysis is based on collections which the author examined in Kew Herbarium. Although the number is small it at least forms a random sample of the known South African resupinates. Of the forty-five species—

13 are recorded only from South Africa;

5 are truly cosmopolitan;

7 are of mixed tropical and temperate affinity, but not fully cosmopolitan;

9 are associated only with Europe and/or North America;

· 11 are associated only with the tropics of the Far East, Africa or America.

These figures will change with the inclusion of new records in the future. The likelihood is that the fungi now appearing as peculiar to South Africa will eventually be linked with tropical ones rather than temperate species, for until now the tropics, especially in Africa, have received less attention from collectors than the temperate regions. It cannot be too strongly emphasised that resupinate Hymenomycetes are far more abundant in South Africa than might be supposed from a list of the species described in this paper. But much work is necessary before the value of new collections which the author is making can be assessed.

A highly specialised habitat is the gold mines of the Transvaal. They are rich in fungi growing on underground timbers and textiles (Brown, 1937), but such fungi have largely been excluded from this study. They frequently vary astonishingly from the normal in this unnatural habitat, and their place of origin is often uncertain, for much timber is imported.

It is seldom possible to record in this paper the substratum with which the described fungi are associated. This aspect of collecting has almost always been neglected, and it is not always possible to be sure of the identity of a fallen stick or branch lying under such a mixed canopy as is usually found in our forests.

MATERIALS AND METHODS OF EXAMINATION

Most material used in these studies consisted of dried herbarium specimens. Wherever possible, these were implemented by the author's own collections of fresh material of the same species, and by specimens from other sources in Kew Herbarium. But in describing and citing collections, reference is made only to South African material, unless otherwise stated.

The techniques used in microscopic work were based on those of Overholts (1929), Martin (1934) and Burt (1914–1926; 1929). In interpreting the nature of the various accessory organs and minute hyphal characters, the work of Overholts (1929) and Pilát (1926) have been closely followed, and their definitions apply here. The terms "generative" and "skeletal" hyphae are used in the sense of Corner (1932 a; 1932 b).

The principal reagents used in mounting and staining sections or crush preparations were: (1) 5 per cent. potassium hydroxide solution, with or without the addition of a very small amount of aqueous 1 per cent. phloxine solution; (2) lactophenol for species which darken too much in KOH, or whose cystidia are soluble in KOH; (3) Melzer's iodine-chloral hydrate for staining conducting vessels and for testing the amyloid reaction of spores; (4) alcohol for removing the air bubbles from tissues; (5) sepia solution, to give a dark-ground effect for detecting a mucilaginous investment of spores; (6) dilute hydrochloric acid for dissolving obstructive mineral inclusions. In general it was not attempted to make permanent preparations. Semi-permanent preparations are made fairly satisfactorily by ringing lactophenol mounts with gold size, Noyer or Krönig cements. These cements all have some or other disadvantage. Polyvinyl alcohol-lactophenol is a good mountant for all but the most delicate resupinates;

this medium may also be used as a ringing agent for lactophenol mounts, but the ring slowly becomes dissolved from the inside and needs renewing after about eight months. When solution of the ring occurs, no obstructive suspension is formed in the mounting fluid. The advantage of this medium as a ringer is that it is fluid, easy to apply, sets clean and transparent within a few hours, and does not chip or crack.

LITERATURE CITED.

	LITERATURE CITED.
BAYER, A. W., &	(1938) Morning and midday relative humidities at Pietermaritzburg, South
COUTTS, J. R. H. BERKELEY, M. J	Africa, S.A. Journ. Sci. 35 (1938) 154. (1843, a) An enumeration of the fungi collected by Zeyher in Uitenhage.
DERKELEY, IVI. J	Hooker's Lond, Journ, Bot, 2 (1843) 507.
THE RESERVE OF	(1843. b). On two Hymenomycetous fungi belonging to the Lycoperdaceous
NEW TOTAL PROPERTY.	group. Hooker's Lond. Journ. Bot. 2 (1843) 200. (1876). An enumeration of the fungi collected at the Cape of Good Hope
	during the stay of the English Transit of Venus Expedition in 1874. Journ. of Bot. 14 (1876) 173.
Bews, J. W	(1912). The vegetation of Natal. Ann. Natal Mus. 2 (1912) 253-331.
-	(1913). An oecological survey of the Midland of Natal with special reference to the Pietermaritzburg district. Ann. Natal Mus. 2 (1913) 485–545.
BOTTOMLEY, A. M	(1917). An account of the Natal fungi collected by J. Medley Wood. S.A.
Brown, Mrs. M	Journ. Sci. 13 (1917) 424-446. (R. Lurie) (1937). Mine timber preservation—Mine Fungi. S.A. Journ.
	Sci. 33 (1937) 383–389.
BURT, E. A	(1914-1926). The Thelephoraceae of North America. Parts 1-15 in Ann. Mo. Bot. Gard. vols. 1-13.
-	(1929). Classification of the species of <i>Corticium</i> by the tissues of the fructification. Proc. Internat. Congr. Plant Sci. 1926, Ithaca. 2 (1929) 1598.
Сооке, М. С	(1879). Natal Fungi. Grevillea 8 (1879) 69 et. seq.
CORNER, E. J. H	(1881). Fungi Exotici. Grevillea 10 (1881) 123. (1932, a). The fruit body of <i>Polystictus xanthopus</i> Fries. Anns. Bot. 46 (1932)
CORNER, L. J. II	71-111.
_	(1932. b). A Fomes with two systems of hyphae. Trans. Brit. Myc. Soc. 17 (1932) 51-81.
DE THÜMEN	(1875). Fungi Austro-Africani. Flora. 58 (1875) 378.
-	(1876). Ibid. Flora. 59 (1876) 362, 423, 568. (1877). Ibid. Flora. 60 (1877) 407.
Every I D Dove	(1878). Ibid. Flora. 61 (1878) 353.
Evans, I. B. Pole	(1922). The Main Botanical regions of South Africa. Bot. Survey Mem-S.A. No. 4 (1922) Pretoria.
EVANS, I. B. POLE, AND BOTTOMLEY, A. M.	(1917). An enumeration of the fungi collected at Kentani in the Cape Province by Miss Alice Pegler, A.L.S., in 1911–1914. Ann. Bolus Herb. 2 (1917)
	185–193.
FRIES, E	(1848). Fungi Natalenses. K. Vet. Akad. Handl. Stockholm (1848) 121–154. (1936). An account of the Plant Ecology of the Dukuduku Forest Reserve
HENKEL, J. S., BALLENDEN, S. AND	and adjoining areas of the Zululand coast belt. Ann. Natal Mus. 8 (1936)
BAYER, A. W. HENNINGS, P	95–125. (1895). Fungi Austro-Africani. Hedwigia 34 (1895) 325.
-	(1898). Ibid. Hedwigia 37 (1898) 293.
KALCHBRENNER, C	(1881, a). Fungi MacOwaniani. Grevillea 9 (1881) 107. (1881, b). Ibid. Grevillea 10 (1881) 57–59.
- C	(1882). Ibid. Grevillea 10 (1882) 104–106.
KALCHBRENNER, C., AND COOKE, M. C.	(1880). South African Fungi. Grevillea 9 (1880) 7.
Léveille, J. H	(1881). Natal Fungi. Grevillea 10 (1881) 27. (1846). Descriptions des champignons de l'herbier du Museum de Paris.
	Ann. Sci. Nat. ser. 3, 5 (1846) 111.
Marloth	(1903, 1905). Results of Experiments for ascertaining the amount of moisture deposited from the south-eastern clouds. Trans. Phil. Soc. S.A. 14 (1903) 403 and 16 (1905) 97.
MARTIN, G. W	(1934) Three new Heterobasidiomycetes. Mycologia 26 (1934) 263.
MONTAGNE, J. F. C	(1847). Enumeratia et descriptio fungorum quos cl. Drège in Africa, etc. Ann. Sci. Nat. ser. 3, 7 (1847) 166.
OVERHOLTS, L. O	
PHILLIPS, J. F. V	(1931). Forest succession and ecology in the Knysna region. Bot. Survey
	S.A. Mem. No. 14 (1931) 159–160.

Pilát, A	(1926). Monographie der mitteleuropaischen Aleurodiscineen. Ann. Myc. 24 (1926) 203-230.
ROGERS, A. W	(1922). Physical features of South Africa. In Bot. Survey S.A. Mem, No. 4 (1922) 9-23.
SIMPSON, M. W., AND TALBOT, P. H. B.	(1946). An enumeration of fungi collected at Qudeni Forest Reserve, Zululand, in February, 1945. S.A. Journ. Sci. 42 (1946) 131-134.
Sydow, P	(1899). Fungi Natalenses. Hedwigia 38 (1899) 130-134.
VAN DER BYL, P. A	(1929). Die Suid-Afrikaanse Thelephoraceae. Ann. Univer. Stellenbosch. 7:A: 3 (1929) 1-52.
-	(1934). Die Suid-Afrikaanse Hydnaceae of Stekelswamme. Ann. Univer-Stellenbosch. 12; A: 1 (1934) 1–9.
Wakefield, E. M	(1936). African fungi collected by O. A. Höeg, in 1929–1930. Kong. Norske Vidensk. Selsk. Forhandl. 9 (1936) 42–53.
WINTER, G	(1884). Repertorium Rabenhorstii Fungi Europaei et extra-Europaei, Cent- XXXI-XXXII. Hedwigia 23 (1884) 164.

TAXONOMIC

(1885). Exotische Pilze. Hedwigia 24 (1885) 21.

In essentials the classification adopted here is that of Bourdot and Galzin in "Hymenomycetes de France" (1928). The genera are grouped thus:—

HETEROBASIDIOMYCETAE

Auriculariaceae (Auricularia; Helicobasidium; Septobasidium). Tremellaceae (Sebacina; Heterochaete).

HOMOBASIDIOMYCETAE-APHYLLOPHORALES

EXOBASIDIACEAE (*Exobasidium*). POROHYDNACEAE

1) Corticieae

Corticinae (Corticium; Peniophora; Punctularia; Aleurodiscus).

Merulinae (Phlebia; Merulius; Coniophora). Stereinae (Stereum; Duportella; Hymenochaete).

Asterostromellinae (Asterostromella).

- 2) Asterostromeae (Asterostroma).
- 3) Hydneae (Mycoleptodon; Lopharia; Acia; Grammothele; Grandinia; Odontia; Hydnum; Radulum).
- 4) Phylacterieae (Thelephora; Tomentella).
- 5) Poreae (Thelepora).

Note.—In the taxonomic section, an exclamation mark (!) after a specific epithet indicates that the type, or authentic material, of that species has been examined.

Except when otherwise stated, herbarium numbers of specimens quoted in this work refer to the collections housed in the Mycological Herbarium of the Union Department of Agriculture in Pretoria, designated in abbreviation as Herb. Pretoriae.

HETEROBASIDIOMYCETAE

Basidia transversely, longitudinally or vertically septate, or deeply divided, or differentiated into probasidia or hypo- and epibasidia; producing spores which on germination develop secondary spores from which the mycelium arises; or if the basidium is undivided, then the characters of spore germination still subsist.

There are relatively few heterobasidiomycetes recorded from South Africa, and of these extremely few are resupinate in habit. This is partly due to the lack of adequate collections, but may eventually prove to be a characteristic of the flora dependent on the climate. Further observation can alone decide. Descriptions and notes on the resupinate species so far recorded follow on the succeeding pages. Where there are several species in one genus, a key to species is provided.

AURICULARIA Bull. ex Fries.

1. Auricularia mesenterica (Dicks. ex Fries) Fries, Epicr. (1838) 555, Hym. Eur. (1874) 646; Berkeley, Outlines of Brit. Fung. (1860) 272; Saccardo Syll. Fung. 6 (1888) 762; Lloyd, Myc. Writ. 5 (1919) 873; Bourdot and Galzin, Hym. de Fr. (1928) 15; Rea, Brit. Basid. (1922) 727.

Helvella mesenterica Dicks., Crypt. Fasc. 1 (1785) 20; Bolton, Hist. of Fung.

Growing about Halifax 3 (1791) Tab. 172.

Auricularia corrugata Sowerby, Eng. Fung. 3 (1803) Tab. 290. Thelephora mesenterica (Dicks.) Pers., Syn. Fung. (1801) 571. Phlebia mesenterica (Dicks. ex Fr.) Fries, Elench. 1 (1828) 154.

Auricularia tremelloides Bulliard, Champ. de la Fr. (? 1780) Tab. 290; Quélet,

Fl. Myc. de Fr. (1888) 24.

Illustrations: Lloyd Myc. Writ. 5 (1919) f. 1490; Rolland, Atlas des Champ. de Fr. (1910) 92, Pl. 106, f. 242; Hussey, Illustr. Brit. Myc. 2 (1855) Pl. 6; Ramsbottom, Handbk. of Larger Brit. Fungi (1923) 156, f. 95.

PLATE 1.

Effused over a wide area, resupinate with narrow reflexed margin, thick, gelatinous-coriaceous, in section up to 1,000 μ thick excluding the tomentum; drying thin and horny, brittle. Hymenium covered by reticulate, plicate ridges up to 1 mm. in height, light reddish brown when fresh, drying livid purplish (dark vinaceous drab to deep quaker drab—Ridgway) with a greyish pruina. Margin thickly tomentose on abhymenial surface, imperfectly zoned greyish and brownish.

Basidia: $4-6\cdot6\times60-73~\mu$, divided by three transverse septa into four cells, each capable

of bearing a lateral sterigma, $2-2.5 \times 21 \mu$.

Spores: hyaline, smooth, cylindric-curved, or ellipsoid with one side depressed, 10-15 \times 4-5.5 μ .

Paraphyses: filamentous, simple or branched, separating the basidia.

Hyphae: gelatinised, 1-2 μ diam., loosely woven in centre of trama but compacted into a darker bordering layer adjacent to the tomentum. Probably only the lumen is seen.

Hairs of the abhymenium: pale coloured, $2-3 \mu$ diam., thickly intertwined, with a very narrow lumen.

Mineral inclusions: found in the hymenium between and beneath the basidia.

Specimens examined: 28495, Rump (251), Town Bush, Maritzburg, Oct. 1934.

The specimen on which this description is based occupied an area of 7×33 inches on an old stump, and the reflexed portion was in most parts only a few millimetres wide. Most European specimens have a widely reflexed part on which the zonation of the hairy surface is quite distinct. Probably when more specimens are found in South Africa it will be discovered that they are not always almost entirely resupinate. The spore size in this specimen is at the lower end of the range recorded for France by Bourdot and Galzin.

2. Auricularia mesenterica var. lobata (Sommerf.) Quél., Sommerf. in Mag. Nat. Vidensk. (1827); Fries, Elench. 2 (1828) 34, Hym. Eur. (1874) 646; Berkeley, Outl. of Brit. Fung. (1860) 272, Pl. 18, f. 1; Bourdot and Galzin, Hym. de Fr. (1928) 15; Rea, Brit. Basid. (1922) 727; v. d. Byl in Ann. Univ. Stellenbosch 1: A: 3 (1923) 10, f. 7. Differs from the species A. mesenterica by the possession of a lobed margin to the pileus, and zones which are glabrous, velutinous or hispid. v. d. Byl (l.c.) records A. lobata from the Victoria Falls and I have also seen a specimen, 23373, Eyles (1312), Apr. 1981, from the same locality in Rhodesia. This specimen was small and sterile, not resupinate, showing a distinctly lobate margin, but otherwise would be taken for A. mesenterica with a rather browner hymenium than usual. In practice is is difficult to maintain A. lobata even as a variety.

HELICOBASIDIUM Patouillard.

1. Helicobasidium compactum (Boedijn) Boedijn! in Archief Theecultuur 4 (1930) 41; Boedijn and Steinmann in Bull. Jard. Bot. Buitenzorg ser. 3, 11 (1931) 169. Septobasidium compactum Boedijn in Comm. Gen. Expt. St. A.V.R.O.S. 26

(1926) 7.

Helicobasidium mompa Tanaka forma macrosporum Hara in Journ. Seric. Assoc. Japan, Tokyo, 6 (1917) 725. [non Septobasidium mompa (Tanaka) Rac.] Helicobasidium purpureum (Tul.) Pat. var. orientale Pat. in Bull. Soc. Myc. de Fr.

36 (1920) 176.

Above Synonymy after Boedijn.

Illustrations: Boedijn (1930 and 1931, l.c.).

PLATE 2.

Resupinate, investing plant parts or soil with a thick, soft, spongy cushion, fawn to chocolate coloured with violet tints, up to 2 cms. in thickness, or occasionally rather thin. Hymenium smooth, dry, membranous, pruinose with spores, coloured fawn to violaceous-fawn. Context concolorous, spongy. Mycelial cords frequently creep over the substratum, according to Boedijn.

Basidia: arising direct from hyphae, without probasidia; cylindrical, at first straight, later curling over like a crozier and 1-4 celled, hyaline, $40-80 \times 5-6 \mu$. (Sterigmata 2, lateral from the basidial cells, when mature $1-2 \times 25 \mu$, fide Boedijn.)

Spores: hyaline, smooth, elliptic with one end round and the basal end attenuate and often abruptly bent at the attachment, $4-5.5 \times 18-23 \mu$.

Hyphae: subhymenial hyphae hyaline or very dilutely coloured, much bent and twisted, profusely branched; tramal hyphae brown, thin walled, lacking clamps, much branched, septate, 4-6-(7) μ wide, chiefly vertically arranged, sometimes forming zones of different densities. Fine granular mineral matter is often scattered among the hyphae.

Specimens examined: On *Pinus luchuensis, E. M. Laughton*, Bergplaats, George, C.P., Aug. 1937 (in Herb. I.M.I.); on *Pinus longifolia*, 27347 and 27346, *D.F.O.*, Timbadola, Louis Trichardt, Oct. 1933; on *Pinus longifolia*, 26855, *D.F.O.*, Hangklip, Louis Trichardt, Oct. 1931 and Sept. 1932; On *Acacia melanoxylon*, 9049, *D.F.O.*, Katberg Main Forest, 1/6/1915 (this specimen is sterile but otherwise agrees with *H. compactum*); on *Pinus longifolia*, 27345, *Forester*, Hangklip, Louis Trichardt, Jan. 1934; on *Pinus sp.* 27701, *Conservator of Forests*, Hangklip, Louis Trichardt, Sept. 1934; on base of dying *Pinus longifolia*, 26329, *Forester*, Hangklip, Louis Trichardt, Oct. 1930; on *Pinus insignis*, 21054, *D.F.O.*, Karatara, Knysna, 13/12/1926 (sterile); on *Acacia melanoxylon*, 9154, *J. D. Keet*, Katberg (basidia present, but no spores; as *Corticium laetum* in Herb. Pretoriae); on *Camellia theifolia*, *A.C. Tunstall*, Assam, India, det. K. B. Boedijn, 22/4/1926.

The pathogenicity of this species on *Pinus* trees in the Transvaal is discussed by Miss Bottomley [in S.A. Jour. Sci. 33 (1936) 374-5]. A note on one of the herbarium sheets, probably copied from a letter from Miss Wakefield, states: "The very thick spongy texture and the stratified hymenium are unusual in the genus *Helicobasidium* and in this respect, as well as in spore characters, the fungus agrees exactly with *Helicobasidium compactum* Boedijn, which is the cause of a serious root disease of coffee in the Dutch East Indies, and has been recorded on various other plants in that region. The species of true *Helicobasidium* are all suspect as root parasites, and this case is therefore particularly interesting . . . The fruiting stage can usually be recognised by the presence of a pale lilac 'bloom' on the surface, due to the abundance of spores. The species is very close to *H. longisporum* described from roots of cacao from Uganda (Kew Bull., 1917). *H. longisporum* forms a delicate, pulverulent layer, and the spores are more deeply coloured and average longer, 20-26-(30) μ ,"

Other species of *Helicobasidium* with lilac, vinous or purple hymenia are: *H. purpureum* (Tul.) Pat. [spores reniform, $10-12-(15) \times 6-7 \mu$], *H. longisporum* Wakef. ! (spores purple, $25-26 \times 4.5 \mu$) and *H. mompa* Tanaka (spores $10-12 \times 5-7 \mu$).

2. Helicobasidium purpureum (Tulasne) Patouillard in Bull. Soc. Bot. Fr. 32 (1885) 171; Saccardo, Syll. Fung. 6 (1888) 666; Boudot and Galzin in Bull. Soc. Myc. de Fr. 25 (1909) 17, Hym. de Fr. (1928) 9; Buddin and Wakefield in Trans Brit. Myc. Soc. 12 (1927) 116–140, cum icones; Patouillard in Bull. Soc. Bot. Fr. 33 (1886) 335–337, Essai Taxon. sur les Hym. (1900) 12; Ware in Trans. Brit. Myc. Soc. 14 (1929) 94; Sampson and Western, Diseases of Brit. Grasses and Herbage Legumes (1941) 42.

Hypochnus purpureus Tulasne in Ann. Sci. Nat. ser. 5, 4 (1865) 295, in Journ. Linn. Soc. Bot. 13 (1871) 37 and Ann. Sci. Nat. ser. 5, 15 (1872), 227.

Helicobasis purpureus (Tul.) Clements and Shear, Genera of Fungi (1931) 341. Rhizoctonia crocorum (Pers.) DC.—Duggar in Ann. Mo. Bot. Gard. 2 (1915) 403; Buddin and Wakefield in Trans. Brit. Myc. Soc. 12 (1927) 116–140, in Ann. Appl. Biol. 11 (1924) 292, in Trans. Brit. Myc. Soc. 14 (1929) 97; Ware in Trans. Brit. Myc. Soc. 14 (1929) 94; Watson in Trans. Brit. Myc. Soc. 14 (1929) 95; Doidge and Bottomley, Revised List of Plant Diseases occurring in South Africa (1931) 35.

Rhizoctonia medicaginis DC.—Eriksson, Die Pilzkrankheiten der Landwirtschaftlichen Kulturgewäsche 1 (1926) 197; van der Byl, Plantsiektes, hul oorsaak

en bestryding (1928) 343.

Rhizoctonia violacea Tulasne, Fungi Hypogaei pg. 188; Saccardo, Syll. Fung. 14 (1899) 1175; van der Lek, Meded. Rijks Hoogere Land-, Tuin-, en Boschbouwschool, Wageningen 12 (1917) 94; Ware in Trans. Brit. Myc. Soc. 14 (1929) 94; Board of Agric. and Fisheries Leaflet 171, London (1906); Eriksson, Fungoid diseases of Agric. Plants (Transl.) London (1912); Eriksson, Die Pilzkrankheiten der Landwirtschaftlichen Kulturgewäsche 1 (1926) 243.

Thanatophyton crocorum Nees; Tuber croci Duby, Sclerotium crocorum Pers.,

Stypinella purpurea Schroeter (fide Saccardo).

Illustrations: Buddin and Wakefield (1927) loc. cit.; See list in Saccardo, Syll. Fung. 20 (1911) 678.

Only the *Rhizoctonia* stage of this species has so far been found in South Africa. It occurs as a mycelial mat, byssoid to compressed, covering the base of stems, roots of small herbs, and potato tubers. It is a distinctive violet colour, often drying to a cinnamon-drab colour, and forming mycelial strands.

Hyphae: (in KOH) reddish-brown with slightly darker thin walls, very even in diameter over long distances, regularly septate, branching almost at right angles, lacking clamps. When old, the cells have thicker walls. Short, swollen cells associated with sclerotia do not occur in the *Rhizoctonia* stage. The hyphae are $(2 \cdot 5)$ -5-(11) μ wide.

In colour and occurrence this forms a very distinctive sterile mycelium.

Specimens examined: As R. crocorum: 35572, Baragwanath, on Solanum tuberosum, Tzaneen, Transvaal, 2/7/1946; 31833, Glasse (N.H.584), on Medicago, n'Karini, Weenen, Natal, 25/4/1917. As R. violacea: 2540, Glasse, on Medicago sativa, Weenen, Natal, 9/7/1912.

SEPTOBASIDIUM Patouillard.

The genus Septobasidium is well represented in the Union, but it is felt that it lies somewhat outside the scope of this paper. However, as the author has worked through all its representatives in the Pretoria Herbarium, he appends the following key to species for the purposes of identification. He has found it impossible to improve on the key,

descriptions and figures of these species given by J. N. Couch in his monograph "The genus Septobasidium," 1938, and therefore quotes this work except in the citation of some of the literature references and herbarium numbers of the specimens which he has examined and identified.

I. Basidia 2-celled, with persisting probasidium.

A.—Context with distinct pillars, 2-3 mm. thick, blackish; surface grey, much cracked, texture firm and hard throughout. 1. S. protractum.

B.—Context without pillars; surface smooth and glabrous in places, colour blueish-grey.

2. S. griseopurpureum.

II. Basidia 4-celled, curved, without persisting probasidium.

Context with distinct pillars: with two horizontal layers, subiculum and top layer, without a winged margin.

A.—Surface smooth or minutely warted, velvety, colour near benzo-brown, usually with a purplish tint; margin with tent-like structures.

3. S. Schweinitzii. B.—Surface smooth at first, becoming slightly wrinkled or cracked, clay colour to drab.

4. S. natalense.

III. Basidia 4-celled, straight, without persisting probasidia.

A.—Context with pillars, usually tall and distinct. Surface smooth, glabrous, buff-coloured; pillars dark brown, unbranched, subiculum whitish.

5. S. pseudopedicellatum.

B.—Context with pillars, usually short and stubby.

(a) Surface with mottled brownish and whitish areas, with large conical spines, otherwise smooth; probasidia irregular.

6. S. grandispinosum.

- (b) Surface smooth but top layer incompletely formed, leaving pinholes and cracks; cream colour to cinnamon brown; probasidia pyriform, borne in clusters (S. carestianum). With surface even less compact, and basidia and spores larger. 7. S. Carestianum var. natalense.
- (c) Surface nearly smooth or with holes, cracks or spines, or mound-like insect houses; purplish-black throughout.

8. S. Curtisii.

IV. Basidia 4-celled, curved, with persisting probasidia.

A.—Context with pillars, tall or stubby, distinct, mostly unbranched; three- or four-layered; surface some shade of grey, usually pale smoke-grey, smooth. 9. S. bogoriense.

B.—Context without pillars; in section less than 500 μ thick; forming small anastomosing patches intermingled with mosses and liverworts; fruiting surface smooth with upturned margins, brownish; rhizomorphs extending between cracks of bark.

10. S. Bagliettoanum.

V. Basidia 4-celled, straight or slightly curved, usually without a probasidial cell. Context with distinct pillars; with closely packed parallel upright threads in the hymenium; context 400-700 \(mu\) thick; hymenium conspicuously cracked.

11. S. philippinense.

- 1. Septobasidium protractum Sydow! in Ann. Myc. 10 (1912) 33; Couch, l.c., p. 91; v. d. Byl in Ann. Univ. Stellenbosch 7 (1929) 22. Specimens examined: 2002, 22552, 30280, 34588.
- 2. Septobasidium griseopurpureum Couch l.c., p. 105. No specimens seen.
- 3. Septobasidium Schweinitzii Burt in Ann. Mo. Bot. Gard. 3 (1916) 324; Couch, 1.c., p. 112. (= Thel. pedicellata Schw., non S. pedicellatum Pat., fide Miss Wakefield in MS. note.) No specimens seen.
- 4. Septobasidium natalense Couch! loc. cit., p. 118. Specimens examined: 2107, 17276, 21011, 25477, 27690.
- 5. Septobasidium pseudopedicellatum Burt in Ann. Mo. Bot. Gard. 3 (1916) 327; Couch, I.c., p. 132; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 22; Coker in Journ. Elisha Mitchell Soc. 35 (1920) 125. No specimens seen.

- 6. Septobasidium grandispinosum Couch! loc. cit., p. 154. Specimens examined: 12463, 20350.
- 7. Septobasidium Carestianum Bres. var. natalense Couch! loc. cit., p. 157. Specimens examined: 26321, 28322, 33555, 22086, 27688, 30824, 34403.
- 8. Septobasidium Curtisii (B. & D.) Boedijn and Steinmann in Bull. Jard. Bot. Buitenzorg iii: 2 (1931) 181; Couch, loc. cit., p. 164.
 Specimens examined: 1890, 2381, 22338, 28522, 17820.
- Septobasidium bogoriense Patouillard in Otto Warburg, Monsunia 1 (1900) 138; Couch, loc. cit., p. 213; Boedijn and Steinmann in Bull. Jard. Bot. Buitenzorg iii: 2 (1931) 205. [= Septobasidium mompa (Tanaka) Rac. non Helicobasidium mompa Tanaka.]
 Specimens examined: 30276.

Van der Byl's description of *S. mompa* [in Ann. Univ. Stellenbosch 7 (1929) 23] is not in accordance with Couch's, nor with the specimens I have seen. Van der Byl's plant differs in purple-brown to blackish colour, lack of pillars, and ovate spores.

Septobasidium Bagliettoanum (Fr.) Bresadola in Ann. Myc. 3 (1905) 164; Couch, loc. cit., p. 241; v. d. Byl in Ann. Univ. Stellenbosch 7 (1929) 23. [=Hypochnus Bagliettoanus Fries, Hym. Eur. (1874) 705.]

This species is noted on the record of v. d. Byl cited above, but he himself does not appear to be sure of the diagnosis and his description, taken from Saccardo, Syll. Fung. 6 (1888) 661, differs in important points from the description in Couch's monograph.

11. Septobasidium philippinense Couch!, loc. cit., p. 247. Specimens examined: 2382, 28962, 34125.

SEBACINA Tulasne.

- 1. Sebacina africana Burt [in Ann. Mo. Bot. Gard. 13 (1926) 338], described from a collection of van der Byl (No. 1342) at Knysna, is stated by McGuire in his monograph of the genus Sebacina [Lloydia 4 (1941) 43] to be "a Corticium with typical clavate undivided basidia at the surface and possessing hyaline subulate gloeocystidia." The present writer has not yet seen specimens of this. The type is in the Farlow Herbarium and there is an isotype in Herb. v. d. Byl, Stellenbosch.
- 2. Sebacina epigaea (B. & Br.) Bourd, and Galz. [in Hym. de Fr. (1928) 39] was collected by Eaton at the Cape and identified by Berkeley as *Tremella epigaea* B. & Br. [Jour. of Bot. 14 (1876) 175]. There is not a specimen in the Berkeley Herbarium at Kew, and apparently the species has not since been collected in South Africa.
- 3. In Herb. Pretoriae No. 11520 (as *Sebacina* sp.) is a specimen which is sterile and consists of a few hyphal strands and much detritus of an amorphous nature resembling white paint. The specimen is certainly indeterminable, and not referable to *Sebacina*.

HETEROCHAETE Patouillard.

1. Heterochaete andina Pat. apud Pat. and Lagerheim in Bull. Soc. Myc. de Fr. 8 (1892) 120; Patouillard, Essai sur les Hym. (1900) 25, f. 18.

This species is described and recorded for South Africa by van der Byl [in Ann. Univ. Stellenbosch 1 (1923) 5, f. 4] but neither of his two collections has been available to me for study.

HOMOBASIDIOMYCETAE.

Basidia always non-septate, claviform, cylindric, ovoid or urniform, bearing at the apex a number of sterigmata (2 or 4, rarely 1-3 or 5-8 or an indefinite number) at whose extremities the spores develop. Probasidia lacking. Spores on germination do not produce secondary spores but give rise to a definite mycelium directly.

There follow descriptions and notes on the resupinate species of the Aphyllophoraceae recorded for South Africa, excluding the genera *Irpex* and *Poria*. Where there are several species in one genus, a key to the species is provided.

EXOBASIDIUM Woronin.

1. Exobasidium Vaccinii (Fuckel) Woronin in Verh. der naturf. Ges. zu Freiburg 1, B. 4, Heft 4 (1867) 397; Sorauer, Handbuch der Pflanzenkrankh. Ed. 3: 2 (1906) 379; Saccardo Syll. Fung. 6 (1888) 664; Patouillard, Essai taxon. sur les Hym. (1900) 35; Ross, Die Pflanzengallen Mittel und Nord Europas 2 Ed. (1927) 29, f. 30; Burt in Ann. Mo. Bot. Gard. 2 (1915) 649; Rea, Brit. Basid. (1922) 725; Bourdot and Galzin, Hym. de Fr. (1928) 75; Donk, Rev. Ned. Hetero- en Homobas. 1 (1931) 124.

Fusidium Vaccinii Fuckel, Fung. Rhen. Exsicc. No. 221.

Exobasidium Andromedae Peck, 26 Rept. of Botanist Univ. N.Y. State (1874) 73; Saccardo, Syll. Fung. 6 (1888) 665.

Exobasidium Azaleae Peck, loc. cit., p. 72; Saccardo, Syll. Fung. 6 (1888) 665;

Bourdot and Galzin, Hym. de Fr. (1928) 76.

Exobasidium Rhododendri Cramer in Rabenh. Fung. Eur. Exsicc. No. 1910; Saccardo, Syll. Fung. 6 (1888) 664; Bourdot and Galzin, Hym. de Fr. (1928) 75.

E. Arctostaphyli Harkness; E. cassandrae Peck; E. discoideum Ellis; E. Karstenii Sacc.; E. Karstenii Lind.; E. Myrtilli Siegm.; E. oxycocci Rostr.; E. Peckii Halst.; E. Vaccinii-Myrtilli (Fuckel) Juel.

Above synonyms after Donk.

Illustrations: Sorauer (1906) l.c.; Patouillard (1900) l.c., f. 26; Ross (1927) l.c., f. 30; Clements and Shear, Genera of Fungi (1931) Pl. 42, f. 14.

PLATE 3, fig. 1.

Fungus parasitic on leaves of higher plants, producing hypertrophy and galls. Mycelium hyaline, inter- and intracellular.

Basidia: produced subepidermally, unilaterally or amphigenously on leaves, in groups, eventually breaking through and projecting beyond the epidermis, clavate, with (2)-4-6 straight thin sterigmata; Basidia $26-40 \times 4-6.6 \mu$.

Spores: spindle-shaped or cylindric, narrowing at one end, straight or curved, hyaline, smooth, with granular contents, $7-15\times 2-4~\mu$, becoming septate and budding off

sessile secondary conidia.

Conidial Hyphae: accompanying the basidia, branched, vertical, projecting beyond the basidia and bearing conidia which are cylindric, narrowed at each end, $1.5 \times 8 \mu$, according to Donk.

Specimens examined: 17819, *Davies*, on *Azalea*, Cape Town, 3/11/23; 30645, *Anderssen*, on *Azalea*, Pretoria (nursery plants imported from Belgium); 34151, *Wager*, on *Azalea*, Gillets, Natal, 28/8/1944; 36110, *Sutton*, on *Azalea*,

Villerust, Durban, 21/11/1946.

The secondary spores are produced as buds from the mature basidiospores, not by a process of germination or renovation. This fact, together with the fact that the basidia are undivided, indicates that *Exobasidium* is a homobasidiomycete and not a heterobasidiomycete. It is likely that the species was introduced into South Africa with *Azalea* plants and is not indigenous to the country.

 Exobasidium Giseckiae Allescher apud Hennings, Pilze Ostafrika, in A. Engler, Die Pflanzenwelt Ostafrikas und der Nachbargebiete (1895) 54; Saccardo, Syll. Fung. 14 (1899) 230; v. d. Byl in Ann. Univ. Stellenbosch 7 (1929) 9. Illustrations: Plate 3, fig. 2.

Fungus parasitic on the leaves and flowers of Giseckia pharnacioides L., producing slight hypertrophy of the infected areas in the form of pale-rosy to distinctly red galls which are amphigenous. Mycelium hyaline, inter- and intracellular.

Basidia: produced subepidermally in groups, eventually breaking through and projecting beyond the epidermis, clavate-cylindric, about $30 \times 3.5 \mu$, with four sterigmata. Accompanied by very narrow paraphyses, unbranched.

Spores: hyaline, at first ellipsoid then later ovate, 8-9 \times 6-6·5 μ (" 6-9 \times 4-5 μ "—Engler).

Specimens examined: Host plant in each case is Giseckia pharnacioides. 2248, J. Burtt-Davy (12824), Kaffraria nr. Christiana, Bloemhof distr., 15/3/1912; 7380, Pott, Magaliesberg, 29/1/1914; 9685, Moran, Kimberley, 31/3/1916; 10033, Potts, Bloemfontein, Feb. 1917; 10054, Fuller, Pienaar's River, Pretoria, 16/3/1917; 21100, Wager, Tuinplaats, Springbok flats, 5/2/1927; 25919, Paynter, Pretoria North, 26/3/1931; 26073, Liebenberg (2848), Nelspruit, May 1931; 26685, Phillips, Magaliesberg, 1/12/1932; 32670, Hean, Taungs, C.P., 8/4/1940; 32804, du Plessis, nr. Vaalwater, N. Transvaal; 26101, Smith (6051), Wonderboom Poort, Pretoria, 22/2/1932; 26629, Wager, Goldin, Nelspruit, 14/12/1932; 550, Pole Evans, Pienaar's Poort, Pretoria, 21/1/1909.

"Erineum" Galls on Gymnosporia buxifolia leaves.

Illustrations: PLATE 4.

Two collections in Herb. Pretoriae, Nos. 11684 and 13087, under the genus Exobasidium prove to be non-fungal galls of the sort which were formerly given the generic name Erineum. The under-surface of the leaves is covered with closely arranged small, golden-yellow pustules from which fascicles of hairs arise, the hairs being large and clavate and bearing a slight resemblance to basidia. However, they are thicker-walled than a basidium, have occasionally up to two transverse septa and always lack any suggestion of sterigmata and spores. No hyphae are present in sections of the galls and there is every indication that the hypertrophy and production of hairs is caused by insect stimulation, possibly by a mite. Most of the cells within the galls are clearly neoplasms in which the nuclei are still plainly visible. An illustration of this structure is given in Plate 4. It is similar to Erineum aureum illustrated in Greville's Scot. Crypt. Flora 1 (1823) Pl. 33.

The specimens referred to above are: 11684, *Junod*, Rikatle, P.E. Africa, 31/5/1918; 13087, *Doidge*, Zilikats Nek, Pretoria, 10/4/1920.

CORTICIUM Pers. ex Fries.

Key to species described:—

1) With gloeocystidia:

- a. Gloeocystidia numerous, immersed, with bright yellow contents; spores 4-5 \times 9-11 · 5 μ . C. luteocystidiatum (1).
- aa. Gloeocystidia immersed, hyaline, often capped by amber coloured resinous globules; spores $3-4 \times 7-10 \mu$ C. pallidum (2).

2) With cystidioles:

Cystidioles rare, immersed or slightly emergent, hyaline, sometimes with a subapical septum; spores pip-shaped, usually agglutinated, $3-4 \times 5 \cdot 5-6 \cdot 5 \mu$ C. gloeosporum (3).

3) Without gloeocystidia or cystidioles:

- a. Fungus bright blue throughout C. caeruleum (4).
- aa. Fungus not at all blue.
 - v. Hymenium waxy, smooth, apricot to cinnamon-buff colour, spores 6-6·7 \times 10-16 μ C. armeniacum (5).
 - w. Hymenium cracking into flaky areoles with whitish subiculum; dirty white to light tan colour; spores 5-7-(9) \times 3·5-(5) μ C. scutellare (6).
 - x. Hymenium tuberculate, reddish-ochre with liver-brown tubercles and pale margin, context dingy yellow; spores 3-4·2 × 4·5-5·5 μ C. tumulosum (7).

- y. Hymenium rosy, paling to flesh colour, smooth or cracked into areoles connected by whitish subiculum; hyphae up to 10 μ wide; spores $6.5-8.3 \times 10-13 \mu$ C. salmonicolor (8).
- z. Hymenium waxy, whitish, like candle grease when fresh, smooth, seldom cracked, drying buff to light pinkish-buff; spores oblong-subspherical, $7-8\times 10-11\cdot 5~\mu$, with prominent apiculi C. confluens (9).
- 1. Corticium luteocystidiatum Talbot apud Wakefield and Talbot in Bothalia 4 (1948) 941, f. 2.

Resupinate, not adnate, membranous, cracking into large separated areas. Hymenium ochraceous-salmon drying to pale yellow-orange, almost smooth or papillate or with fine raduloid ridges. Margin lifting from substratum on drying, sometimes with small indentations, rarely distinctly fibrillose-radiate. Context concolorous, about 300 μ thick. A bright yellow colour develops on contact with KOH.

Basidia: clavate, very variable size, up to 40 μ long.

Spores: $4-5-(6) \times 9-11 \cdot 5-(12) \mu$, cylindric or ellipsoid, frequently with one side depressed or flattened, hyaline, smooth.

Gloeocystidia: Numerous, conspicuous, with bright yellow oily globular contents, scattered throughout the subhymenium and trama except next to the substratum, often penetrating the hymenium, irregular elongated outline, about $60-80 \times 6-14$ μ , irregular or clavate to cylindrical.

Hyphae: very fine, mostly indistinct, basally horizontal, the superior hyphae erect.

Specimens examined: 28307, Rump (241), Town Bush, Maritzburg, Oct. 1934; 28557, Rump (167), Impolweni, Natal, Sept. 1934; 28690, Rump (283) Town Bush, Maritzburg, Nov. 1934; 28679, Rump (319. b) Town Bush, Maritzburg, Nov. 1934; 28947, Doidge, Xumeni, Donnybrook, Natal, July 1935; 34378, Rump (644) Krantzkop, Natal, 1935; 27759, Rump (104), Town Bush, Maritzburg, Aug. 1934; Belgian Congo: (Specimens in Herb. Kew) Mission Agronomique, P. Hyac. Vanderyst (16309 and 16325), 1925.

This species is one of the relatively few with bright yellow gloeocystidia and is distinguished especially by its hymenium colour and by its spores. The colour reaction with KOH is a help in diagnosis. *C. abeuns* Burt, recorded from South Africa, has almost colourless gloeocystidia and spores of a different size and shape $(6-7 \times 4-6 \mu)$. *C. seriale* Fr., another species with bright yellow gloeocystidia has larger spores, $6 \times 10-13 \mu$ and is otherwise different, particularly in colour.

Corticium pallidum Bresadola, Fung. Trident, 2 (1898) 59; Rogers and Jackson in Farlowia 1 (1943) 296.

Gloeocystidium pallidum (Bres.) Höhnel and Litsch. in K. Akad. Wiss. Wien Sitzungsb. 116 (1907) 838; Bourdot and Galzin, Hym. de Fr. (1928) 258.

Gloeocystidium argillaceum von Höhnel and Litschauer in K. Akad. Wiss. Wien Sitzungsb. 117 (1908) 1094 (nomen nudum); Ibid in Österr. Corticeen (1908) 67 (with description); Bourdot and Galzin Hym. de Fr. (1928) 258.

Gloeocystidium pallidum subsp. argillaceum sensu Bourd. and Galz. in Bull. Soc.

Myc. de Fr. 28 (1913) 263, Hym. de Fr. (1928) 258.

Corticium ochrofarctum Burt in Ann. Mo. Bot. Gard. 13 (1926) 275. [Non Corticium (Peniophora) argillaceum Bresadola, Fung. Trident. 2 (1898) 63, nec Peniophora carneola (Bres.) Höhnel and Litsch., Österr. Corticeen (1908) 70].

Above synonymy after Rogers and Jackson, loc. cit.

Illustrations: Höhnel and Litschauer (1907) loc. cit. (As Gloeocystidium pallidum.)

PLATE 5.

Resupinate, indeterminate, granular, very thin, up to $140~\mu$ in thickness, crustose, whitish becoming spotted with dark resinoid granules giving the whole hymenium a beige colour, adnate, non-continuous under the lens, subfarinaceous.

- Basidia: "20-45 \times 5-8 μ " (Bourd. and Galz.), with 2 or 4 long, straight sterigmata, 4-6 μ in length.
- Spores: Oblong or subcylindric, often with one side depressed, hyaline, smooth, often uniguttulate, 7-10 \times 3-4 μ .
- Gloeocystidia: fusiform, or obtuse at upper end, hyaline, thin walled, with homogeneous contents, $48-60\times4-7~\mu$, capped by resinous granules, immersed throughout the trama.
- Resinous granules: amber to reddish-brown, irregular in size and shape but commonly $13-20~\mu$ diam., often aggregated, capping gloeocystidia and hymenial hyphae, deposited in all parts of the trama, partly soluble in hot lactic acid.
- Hyphae: hyaline, completely indistinct in the specimen seen from South Africa. "Often little distinct, $2-3-4\cdot 5~\mu$ diam., with rare clamps, the mycelial hyphae more regular, $2-5~\mu$."—Bourd. and Galz.
 - Specimens examined: Exsicc. Brinkmann Westfälische Pilze iv, No. 157; 28939, Doidge and Morgan, Donnybrook, Natal, February, 1935.

Peniophora argillacea Bres., a species which produces amber coloured resinous granules, was at first confused with the present species by von Höhnel and Litschauer, but it differs in having emergent, thin-walled cystidia up to 100 μ long, and considerably wider elliptic-depressed spores. These differences were first observed by Bourdot and Galzin. Recently Rogers and Jackson (1943, l.c.) have shown that Gloeocystidium argillaceum Höhnel and Litsch. should be regarded as a synonym of Corticium pallidum Bres., raising it from the subspecific status suggested by Bourdot and Galzin (1913, l.c.).

3. Corticium gloeosporum Talbot apud Wakefield and Talbot in Bothalia 4 (1948) 940. *Illustrations*: PLATE 6.

Resupinate, orbicular when young becoming widely effused and confluent, adnate, later areolately cracked and separable, the edges of the cracks sometimes lifting, often showing a silky fibrillose whitish subiculum between the cracks. Hymenium smooth, somewhat waxy, undulate or tubercular in places, cream coloured, becoming pale buff tinged incarnate, or rosy buff paling in the herbarium. Margin abrupt or very narrowly radiating in white adnate hyphae. Context creamy, 200–500 μ thick.

- Basidia: cylindric-clavate, in close fascicles forming a very compact palisade, 4-5.5 \times 24-30 μ , usually with a clamp connection at the base of the basidium, arising from deep seated hymenial hyphae.
- Spores: pip-shaped, $3-4 \times 5 \cdot 5 6 \cdot 5 \mu$, smooth, hyaline, usually agglutinated in groups of up to 4 spores in number, with a basal apiculus, often somewhat curved, not amyloid.
- Cystidioles: rather rare usually, very slightly emergent, or immersed, fusiform, hyaline, thin walled, with a pointed apex, occasionally with a subapical septum, $4-5 \times 32-45 \mu$, with homogeneous contents.
- Hyphae: subhymenial hyphae more or less erect, thin walled, rather indistinct; basal hyphae very distinct, thin walled, much branched, septate, with abundant clamp connections and occasional H-anastomoses, $2-5~\mu$ wide, closely interwoven in a subhorizontal direction.
 - Specimens examined: Type, 28288, Rump (212), Town Bush, Maritzburg, Oct. 1934, on indigenous wood possibly Fagara capensis; 27603, Rump (26), Bulwer, Natal, 1934, on bark of wattle; 28712, Joubert, Windy Hill Estate, Maritzburg, on bark of Acacia mollissima, 30/10/1936.

This species differs from *Corticium laeve* Pers. principally in having basidia and spores which are very considerably smaller. (C. laeve basidia 25-40-90 \times 4.5-9 μ ; spores 7-9-12 \times 4.5-7 μ , in European specimens.) C. laeve has not been collected in

South Africa. Corticium gloeosporum corresponds almost exactly with C. laeve in external features but is perhaps more areolately cracked and thinner at the margin; the spores of both species have the highly characteristic pip-shape and the property of adhering to one another; their hyphae correspond almost exactly; the presence of similar cystidioles and of basal clamps to the basidia are other points of similarity. C. gloeosporum is almost certainly the South African analogue of C. laeve. In one of the specimens (28712) some of the hyphae have a finely granular incrustation which is soluble in potassium hydrate. Large cystidioles may be interpreted by some workers as cystidia, with consequent change of genus, but in assigning this species to Corticium the author has followed the practice observed with C. laeve. If mounts of the spores are made in weak sepia solution it can readily be observed that each spore has a very narrow mucilaginous investment which may account for their property of adhering together in groups. [This property does not seem to be very common but it has also been observed in Corticium centrifugum (Lév.) Bres. and Cytidia flocculenta (Fr.) Höhnel and Litschauer.]

4. Corticium caeruleum (Schrad. ex Fr.) Fries, Epicrisis Syst. Myc. (1838) 562, Hym. Eur. (1874) 651, Fung. Natalenses (1848) No. 38; Berkeley, Outl. Brit. Fung. (1860) 274; Kalchbrenner in Grev. 10 (1881) 59; Massee in Journ. Linn. Soc. Bot. 27 (1890) 151; Saccardo, Syll. Fung. 6 (1888) 614; Quélet, Flor. Myc. de Fr. (1888) 10; Wakefield in Trans. Brit. Myc. Soc. 4 (1913) 119; Rea, Brit. Basid. (1922) 673; Burt in Ann. Mo. Bot. Gard. 13 (1926) 301; Bourdot and Galzin, Hym. de Fr. (1928) 183; Petch in Ann. Roy. Bot. Gard. Peradeniya 9 (1925) 287; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 27.

Thelephora caerulea Schrader in De Candole Fl. Gall. Fr. 2 (1815) 107; Persoon, Myc. Eur. 1 (1822) 147; Fries, Elenchus Fung. (1828) 202; Hussey, Illustr. Brit. Myc. 1 (1847) t. 20 b.

Byssus phosphorea Linn., Spec. Plantarum Ed. 3, 2 (1764) 1638.

Auricularia phosphorea (L.) Sowerby, Eng. Fung. (1803) t. 350.

Mycinema phosphoreum (L.) Agardh., Systema Alg. (1824) 33.

Thelephora indigo Schweinitz in Naturforsch. Ges. Leipzig Schrift 1 (1822) 107 (fide Burt).

Thaelaephora fimbriata Roth, Catalecta Botan. 2 (1800) 257, tab. 9, f. 2.

Thelephora atro-coerulea Trog. in All. Bot. Zeit. 2 (1832) 560.

Illustrations: Wakefield (1913) loc. cit., t. 3, f. 26; Sowerby l.c., as Auricularia phosphorea; Hussey l.c., as Thelephora caerulea.

PLATE 7.

Resupinate, effused, velutinous-floccose becoming membranous, separable when moist, bright indigo to Prussian blue throughout. Margin concolorous or paler, thinning out, satiny. Colour changing immediately to greenish in potassium hydrate. Context loose, 200–400 μ thick.

Basidia: $5 \cdot 5 - 8 \times 30 - 40 \mu$, with 2-4 sterigmata.

Spores: not seen in S. African specimens, "hyaline, ovate-elliptical, 7-9 \times 4-6 μ "—Wakefield.

Hyphae: loosely intertexed, 4-5 μ diam., with numerous septa and clamp connections, thick walled, coloured blueish especially near the hymenium. A few of the hyphae are thinwalled.

Specimens examined: 26847, Ackerman (2), Maritzburg, 1933 (in Herb. Kew); 28888, Bottomley, The Cavern, Drakensberg, Natal, 1927; 27801 Craik, Caverns Valley, Mont-aux-Sources, Natal, Feb. 1935; 34320, Doidge, Xumeni, Donnybrook, July 1944; 35323, Rump, (590), Karkloof Bush, March 1944;

33206, Doidge and Bottomley, Wolhuterskop, Rustenburg Distr., 5/5/1939; van der Byl (1051), East Africa, 1923; Maitland (38) 1929, (110) Jan. 1931, (106) Dec. 1930, Cameroon Mountains.

5. Corticium armeniacum Saccardo, Syll. Fung. 6 (1888) 637 (non C. armeniacum B. & C.! nomen nudum, in Herbarium, which is an Asterostromella).

Corticium ceraceum Berk. and Ravenel! in Ravenel Fung. Car. Exsicc. 3 (1855) 29, nom. nudum; Massee in Jour. Linn. Soc. Bot. 27 (1890) 150; Höhnel and Litschauer in K. Akad. Wiss. Wien Sitzungsb. 116 (1907) 785, f. 6; Burt in Ann. Mo. Bot. Gard. 13 (1926) 216; v. d. Byl in Ann. Univ. Stellenbosch 7 (1929) 30.

Corticium molle B. and C. ! in Jour. Linn. Soc. Bot. 10 (1868) 336, Grevillea 1 (1873) 180. (non C. molle Fries.)

Corticium mauritianum Berk. ! in Herb.

Illustrations: Höhnel and Litschauer l.c., text fig. 6.

PLATE 8.

Resupinate, widely effused, fleshy then becoming very membranous-ceraceous, somewhat shiny, very smooth, with very occasional cracks, not adnate. Hymenium apricot colour becoming cinnamon-buff in the herbarium. Margin lighter in colour. Context white, $100-500~\mu$ thick.

Basidia: flexuous, narrow-clavate, (30)-56 \times (5)-7 μ ; sterigmata and spores not seen in South African material; sterigmata 4, thick, curved, 10-14 \times 1·5-3 μ fide Höhnel and Litschauer, loc. cit.

Spores: (from type) long ellipsoid to cylindrical, flattened unilaterally, usually with a prominent apiculus, $6-6.7 \times 10-16 \mu$, hyaline, smooth.

Hyphae: in a generally erect position; those below the hymenium very compact and indistinct; basal hyphae erect or suberect, 3-3·5-4 μ wide, at first distinct but later cleaving together and modified by waxy coating; clamp connections, when present, are quite numerous and frequently in whorls, sometimes absent.

Minerals: quite large concretions sometimes found in the upper layers of the trama.

Specimens examined: Ravenel Fung. Car. 3, No. 29, in Herb. Kew; v. d. Byl (2568), Natal, 1930; 27802, Conservator of Forests, Manubi, Butterworth, Cape, 23/10/1934, on Ekebergia capensis; 30227, Rump (445), Krantzkop, Nov. 1935; 30219, Rump (429), Compensation Beach, Natal, Dec. 1934; 34326, Rump, Town Bush, Maritzburg, 1935; 36708, Talbot, Kloof Falls, Natal, May 1948; Dümmer (2398), on Ficus sp., Kipayo, Uganda, Apr. 1915.

The type of the species, from North America, has very variable spores which at their narrowest measure $5.5~\mu$, depending in the same spore on the side from which it is viewed. The Uganda specimen cited above is undoubtedly this species, but its spores are $4.5-5.5~\times~9-13~\mu$, oblong-elliptic, and lacking a prominent apiculus.

6. Corticium scutellare Berk. and Curtis! in Grevillea 2 (1873) 4; Saccardo, Syll. Fung. 6 (1888) 634; Massee in Jour. Linn. Soc. Bot. 27 (1890) 128; Burt in Ann. Mo. Bot. Gard. 13 (1926) 192; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 27. Illustrations: van der Byl loc, cit., Pl. 2, f. 9.

PLATE 9.

Resupinate, effused, dirty-white becoming light tan, waxy, adnate, thin, 100-250 μ in section, cracking into small irregular areoles in great profusion, sometimes flaking away and leaving a little of the white subiculum behind. Context whitish.

Basidia: clavate or obconical, circa $24-33 \times 4-7 \mu$, with 2 or 4 short, curved sterigmata.

Spores: In the type specimen $7-9 \times 4-5 \mu$, elliptical; fide Burt loc. cit., hyaline, smooth, $4-6 \times 2-3 \mu$; as observed in South African specimen, $5-7 \times 3.5 \mu$, elliptical, flattened unilaterally, with a distinct apiculus.

Hyphae: narrow, $2 \cdot 5 - 3 \cdot 5 \mu$ wide, more or less erect below the basidia, but so mixed with mineral inclusions in the deeper tissues as to be almost indistinguishable.

Specimens examined: Type, 2473 Car. Inf., in Kew Herbarium; 27680, Rump (53), Winterskloof, Natal, 1934.

It will be noted that the spores in the South African specimen are smaller than those in the type, but not as small as those quoted for the species by Burt. Further collections are required to establish the range of variation in spore size; in all other characters the South African specimen is a good match with the type of the species.

7. Corticium tumulosum Talbot apud Wakefield and Talbot in Bothalia 4 (1948) 941, f.3.

Resupinate, closely adnate, orbicular becoming effused, cracking deeply crosswise in one direction. Margin thinning out to a definite, pale coloured edge. Hymenium tuberculate, waxy, papillate or ridged, the raised portions being liver-brown in colour and the remainder reddish-ochre. Context dingy yellow, showing through the cracks. In section 60–100–(200) μ including basal layers which separate the periderm cells of the substrate and also contain much crystalline matter.

Basidia: cylindric-clavate, $28-34 \times 5.5 \mu$ with 4 short, curved sterigmata.

Spores: hyaline, smooth, broadly ellipsoid, $3-4\cdot 2 \times 4\cdot 5-5\cdot 5 \mu$.

Hyphae: distinct, pale yellowish horizontal weft: the few hyphae which curve abruptly into the hymenium are colourless; septation frequent, without clamp connections, $3-4~\mu$ wide, thin walled.

Minerals: A great deal of amorphous or crystalline mineral matter at the base of the trama.

Specimens examined: 28897, *Lansdell*, The Willows, Pretoria distr., 27/4/1937; 36857, *Talbot*, Garstfontein, Pretoria distr., 21/8/48.

In external appearance, and especially in colour, C. tumulosum is very much like C. caeaoicolor Petch! [in Ann. Roy. Bot. Gard. Perad. 9 (1925) 288]. The latter, however, has spores which are oblong-ovate, $3 \times 7 \mu$, and hyphae which are much finer and less distinct than those of C. tumulosum.

8. Corticium salmonicolor Berk. and Broome! in Jour. Linn. Soc. Bot. 14 (1873) 71; Saccardo, Syll. Fung. 6 (1888) 620; Burt in Ann. Mo. Bot. Gard. 13 (1926) 227; Massee in Jour. Linn. Soc. Bot. 27 (1890) 122; Petch, Phys. and Diseases of Hevea brasiliensis (1911) 209, Diseases and Pests of the Rubber Tree (1921) 134, Ann. Roy. Bot. Gard. Perad. 9 (1925) 281; Brooks in Agric. Bull. F.M.S. 2 (1914) 238; Brooks and Sharples in Dept. Agric. F.M.S. Bull. No. 21 (1914) figs. 1-19; Rorer, Trinidad Dept. Agric. Bull. 15 (1916) 86, f. 1-2; Fawcett, Citrus Diseases and their Control (1936) 324; Lee and Yates in Philippine Jour. Sci. 14 (1919) 657, Pl. 1-7.

Necator decretus Massee! in Kew Bull. (1898) 119; Saccardo, Syll. Fung. 16 (1902) 1094; Rant in Bull. Jard. Bot. Buitenzorg 4 (1912) 1, f. 1-14.

Corticium javanicum Zimmermann in Centralbl. für Bakt. 7 (1901) 103, f. 3 [non C. javanicum (P. Henn.) Sacc. and Syd.]; Rant, (1912) loc. cit.

Corticium Zimmermanni Sacc. and Syd. In Saccardo, Syll. Fung. 16 (1902) 1117; ibid 17 (1905) 169.

Illustrations: Brooks and Sharples, 1914 l.c.; Rant, 1912 l.c. (as C. javanicum); Zimmermann, 1901 l.c. (as C. javanicum).

PLATE 10.

Type: in Herb. Kew, from Ceylon.

Resupinate, effused, membranous-pellicular, hymenium rosy when fresh, drying fleshy-buff or creamy-yellowish colour in the herbarium, smooth, cracked into many small areoles connected by whitish subicular strands. Context 250-350 μ thick.

Basidia: irregularly cylindric-clavate, 6-8 \times 26-40 μ .

Spores: hyaline (pale rosy tint in a mass), broadly elliptic to ovate or subglobose, often unilaterally depressed, $6 \cdot 6 - 7 - 8 \cdot 3 \times 10 - 13 \cdot 2 \mu$, with a prominent basal apiculus.

Hyphae: hymenial hyphae densely aggregated and indistinct; basal hyphae strand-like, hyaline, thickwalled, seldom branched, with frequent septa; superior hyphae much branched, with frequent septa, thin walled. All hyphae take stain readily except in their walls; rare H-anastomoses but no clamps seen, hyphae loosely intertexed, the basal ones horizontally, the superior ones ascending. Hyphal width $6-10-11\cdot 5~\mu$, their width and thickness of walls progressively diminishing from the basal tissues upwards.

Conidial stage: (Necator decretus). Not seen in South African specimens.

Specimens examined: 31998, Ballenden, on Pyrus malus, Maritzburg, 8/1/1918; 12829, Maritzburg, Natal; 34168, Forest Officer, on dead Quercus reticulata, Tweefontein nr. Sabie 21/4/1944; 20669, Dungan, on Pyrus malus, Town Bush, Maritzburg, 19/2/1926 (as C. laetum); 12177, Marshall, on Pyrus malus, Hilton Road, Natal, May 1919 (as C. laetum); 14479, Govt. Horticulturist, on Pyrus malus, Hilton Road, Natal, Feb. 1921 (as C. laetum); Brooks, on Ipomaea carnea, Malay States, 16/10/1914 (incl. Necator stage) in Herb. Kew; Jacobson, ex Herb. Hort. Bot. Bog. (6019), Sumatra, 1924, in Herb. Kew; Rorer, on Cacao, Trinidad, July 10, 1915, in Herb. Kew; MacDonald, on leaves of Coffea, Kenya, Dec. 1923 and March, 1924, in Herb. Kew; Type from Ceylon in Herb. Berkeley at Kew; Petch, on Hevea brasiliensis, Ceylon, 1913.

Apart from its parasitic occurrence on woody plants, a thinner more areolately cracked hymenium, and possibly somewhat thicker walls to the basal hyphae, this species is so near to *C. laetum* (Karst) Bres. in microscopic structure that a very close relationship must be implied. *C. laetum* is more membranous, smooth, lacking areoles connected by subicular strands. It has been reported by Stevens [The Fungi which cause Plant Disease (1913) 408] as parasitic on apple and fig trees.

C. roseum Pers. (= C. roseolum Massee !) bears a resemblance to these species but its spores are smaller (6 \times 9-10 μ) and its thick-walled, narrow (2·5-5 μ) hyphae have numerous clamp connections.

C. aurora Berk.! differs from C. laetum in texture and thickness, but more especially in its spores which are subclavate, slightly curved, basally attenuated, $13-16 \times 3-4 \mu$ [see Bourdot and Galzin, Hym. de Fr. (1928) fig. 62]. Massee [in Jour. Linn. Soc. Bot. 27 (1890) 141] recorded the spores as "ellipsoid, basally apiculate, $10-11 \times 7-8 \mu$," which led Höhnel and Litschauer to suggest its identity with C. laetum. In fact, it is not confusable with this or with C. salmonicolor.

Corticium confluens (Fries) Fries, Epicr. Syst. Myc. (1838) 564, Hym. Eur. (1874) 655; Berkeley, Outl. Brit. Fung. (1860) 276; Saccardo, Syll. Fung. 6 (1888) 626; Massee in Jour. Linn. Soc. Bot. 27 (1890) 133; Bresadola in I.R. Accad. Agiati Atti, iii, 3 (1897) 112; Bourdot and Galzin in Bull. Soc. Myc. de Fr. 27 (1911) 252, Hym. de Fr. (1928) 212; Rea, Brit. Basid. (1922) 679; Burt in Ann. Mo. Bot. Gard. 13 (1926) 220; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 29.

Thelephora confluens Fries, Syst. Myc. 1 (1821) 447.

Corticium confluens var. subcalceum Karsten in Rev. Myc. 10 (1888) 74.

Above synonymy after Burt.

Illustrations: PLATE 11.

Resupinate, widely effused, when fresh waxy-membranous, whitish, sometimes glistening with raised hairs at the surface, appearing like a patch of candle grease; rather adnate when dry, and drying membranous, smooth, seldom cracked, buff to light pinkish buff. Margin paler, thinner and either finely radiate-byssoid or ending abruptly. Context pale buff, 200-500 μ thick in section.

Basidia: cylindric-clavate, somewhat contorted, large, $6.5-11.5 \times 50-80 \mu$, often guttulate, with sterigmata 4.5μ long, or longer.

Spores: $7-8 \times 10^{-11 \cdot 5} \mu$; hyaline, oblong-subspherical or broadly ovoid, with a prominent lateral apiculus, smooth, with finely granular content (stippled appearance) or with large guttules, abundant.

Paraphyses: simple, smooth, about 2 μ wide, interspersed among the basidia, sometimes with up to four short lateral branches near the apex. Occasionally these paraphyses are lacking.

Hyphae: superior hyphae more or less vertical, agglutinated, rather indistinct, thin-walled, hyaline, with few clamps, 2-3 μ wide. Basal hyphae usually more or less horizontal and entirely collapsed or very indistinct.

Specimens examined: 35328, Rump (687), on Quercus, Maritzburg, 1943; 36850, Talbot, on Acacia sp., Buffelspoort, Rustenburg distr., 12/8/1948; 36914, Talbot, Fountains Valley, Pretoria, 24/10/48.

Bourdot and Galzin (1928) point out the interesting fact that *Corticium confluens* and *Radulum membranaceum* (Bull.) Bres. have the same internal structure and spore characters, and that the corticioid form may pass into the raduloid in some specimens. The large oblong spores with prominent apiculi are unmistakable, as also is the "candle grease" appearance of fresh specimens.

SYNONYMS AND EXCLUDED SPECIES IN THE GENUS CORTICIUM:

atrocinereum Kalchbr., nomen nudum, = Stereum Schomburgkii Berk. (q.v.) if the MacOwan specimen in Herb. Kew is authentic.

calceum Fries sensu Romell and Burt. Nomen confusum fide Rogers and Jackson in Farlowia 1 (1943) 284. The MacOwan specimen in Herb. Kew. is Aleurodiscus acerinus (Pers.) Höhn and Litsch. (? var. longisporus Höhn. and Litsch) q.v.

calceum Fries var. lacteum Fries. Nomen confusum. MacOwan (1074), Somerset East, is the type specimen of Aleurodiscus acerinus var. longisporus Höhn. and Litsch.

ceraceum Berk. and Ravenel. Nomen nudum = Corticium armeniacum Sacc.

cinereum Pers. ex Fries. = *Peniophora cinerea* (Pers. ex Fr.) Cooke.

Dregeanum Berk. = Lopharia Dregeana (Berk.) comb. nov. (q.v.).

nudum Fries. = Peniophora nuda (Fr.) Bres. (q.v.).

CORTICIUM SPECIES RECORDED FOR SOUTH AFRICA, BUT NOT AVAILABLE FOR STUDY. abeuns Burt—v. d. Byl in Ann. Univ. Stellenbosch 7 (1929) 29; in S.A. Journ. Sci. 23 (1926) 288.

bombycinum (Sommerf.) Bres.-Miss E. M. Wakefield in Litt.

lacteum Fries—v. d. Byl (1929) loc. cit., p. 30 [fide Rogers and Jackson in Farlowia 1 (1943) 294, this is a *nomen dubium*].

pelliculare Karst—v. d. Byl (1929) loc. cit., p. 29.

portentosum B. and C. !—v. d. Byl (1929) loc. cit., p. 28. South African specimens of this species which the author has so far seen are all considered to be *Asterostromella duriuscula* (B. and Br.) comb. nov. (q.v.).

vagum B. and C.—Phillips in Bot. Survey of S.A. Mem. 14 (1931) 159.

PENIOPHORA Cooke.

Key to species described:-

- Context yellow-buff or isabelline colour, turning strong violet colour instantly on application of a drop of potassium hydroxide solution.

 P. filamentosa (5).
- 2. No violet colour reaction with potassium hydroxide solution:
 - A.—Cystidia occupying a relatively narrow zone confined to the hymenium and subhymenium:
 - a) Cystidia occupying a zone 70–100 μ thick above a byssoid subiculum of thick-walled hyphae; cystidia encrusted, 20–36–(40) \times 10–13 μ , fairly thin-walled P, pelliculosa (1).
 - aa) Cystidia thick-walled, heavily encrusted, $36-80 \times 10-11 \cdot 5 \mu$; subicular hyphae not byssoid, indistinct *P. gigantea* (6).
 - AA.—Cystidia not in a distinct zone above the subiculum, staged throughout the trama or at least originating in mid-trama:
 - a) Cystidia septate, thin-walled, often with clamp connections, encrusted

P. aspera (2).

aa) Cystidia not septate or clamped, thick-walled, densely encrusted:

- b) Cystidia 6-10 \times 50-120 μ ; spores 2·5-3 \times 6·8 μ ; hyphae distinct, 3-6 μ wide P, arenata (3).
- bb) Cystidia 10–16 \times 50–70 μ ; spores 3 \times 5 · 5 μ ; hyphae agglutinated, 3 μ wide *P. Roumeguerii* (4).

1. Peniophora pelliculosa sp. nov.

Illustrations: PLATE 12.

Type: 30231, Rump (450), on indigenous wood, Krantzkop, Natal, Dec. 1935. In Herb. Kew with isotypes in Pretoria Herbarium and Herb. University of Toronto.

Resupinate, widely effused, thick, soft, pellicular, separable when moist. Hymenium very smooth, usually not cracked, coloured "pinkish-buff" (Ridgway), or a more fleshy-yellow, able to flake off like plaster leaving the byssoid white subiculum showing beneath. Margin indeterminate byssoid to arachnoid. Context floccose, white, width in section 550-1,000 μ .

Basidia: cylindric-clavate, compact in fascicles, 5-6 \times 16-23 μ (immature).

Spores: ellipsoid or oblong, $3-3\cdot 3\times 5-7$ μ , smooth, hyaline.

Cystidia: in a zone 70-100 μ thick above the subiculum, mostly immersed, a few projecting up to 12 μ , relatively thin-walled, some thickened at the apex, heavily encrusted with mineral matter which dissolves in KOH, 20-36-(50) \times (8)-10-13 μ , more or less cylindric-clavate to obconic, frequently capitate-encrusted only.

Hyphae: indistinct in cystidial layer; in context very distinct, branched, hyaline, septate, without clamps, loosely interwoven, rather thick-walled, with an incrustation of large detersile crystals especially under the cystidial zone, $3 \cdot 5 - 5 - 6 \cdot 5$ μ wide, somewhat narrower beneath the hymenium.

Specimens examined: Type, 30231, Rump (450), Krantzkop; 34383, Rump (653), Krantzkop, Natal, 1935; 34359, Rump (559), Krantzkop, Natal, 1935.

This species falls in the group containing P. cremea Bres. (for which it has been mistaken in South Africa) and P. subiculosa Burt. The latter species has not been seen, but it is evidently thinner and has a chamois-coloured subiculum and spores which are smaller, $3-3\cdot5\times2\cdot5$ μ [Burt in Ann. Mo. Bot. Gard. 12 (1925) 259]. P. cremea is not so thick and byssoid-pellicular as the new species, and has larger cystidia which project further. The mineral encrustation is much more marked in the cystidia and hyphae of the new species. I have much pleasure in acknowledging the assistance of Dr. H. S. Jackson of Toronto University, who examined collections of this species and reported: "The combination of rather short incrusted cystidia with the byssoid subiculum of thick-walled hyphae makes this unique among the species I am familiar with."

 Peniophora aspera (Pers.) Saccardo, Flor. Ital. Crypt. Hymen. (1916) 1182; Rogers and Jackson in Farlowia 1 (1943) 282.

Peniophora setigera (Fr.) Höhnel and Litschauer in K. Akad. Wiss. Wien Sitzungsb. 115 (1906) 7.

Peniophora setigera (Fr.) Bresadola in Litt.; Rea, Brit. Basid. (1922) 692; Bourdo and Galzin, Hym. de Fr. (1928) 309.

Kneiffia setigera Fries, Epicrisis Syst. Myc. (1838) 529; Bresadola, Hym. Hung.Kmetiani (1897) 40, in Ann. Myc. 1 (1903) 103; Saccardo, Syll. Fung. 6 (1888) 510 and ibid. 9 (1891) 218; Karsten in Hedwigia 28 (1889) 195.

Odontia setigera (Fr.) Miller in Mycologia 26 (1934) 19, Pl. 2, f. 3.

Corticium latitans Karsten in Rev. Myc. 10 (1888) 74, fide Rogers and Jackson (l.c.).

Corticium Berkeleyi Cooke and Massee in Journ. Linn. Soc. Bot. 27 (1890) 133; Burt in Ann. Mo. Bot. Gard. 13 (1926) 183, fide Rogers and Jackson (l.c.).

Corticium myxosporum Karsten, Symb. Myc. Fenn. 9, p. 53; Saccardo, Syll. Fung. 6 (1888) 635; Massee in Journ. Linn. Soc. Bot. 27 (1890) 130; Höhnel and Litschauer in K. Akad. Wiss. Wien Sitzungsb. 115 (1906) 7, [non C. myxosporum sensu Bresdola in Ann. Myc. 1 (1903) 94.].

Illustrations: Miller (1934) loc. cit., as Odontia setigera.

PLATE 13.

Resupinate, effused, membranous-byssoid, firmly adnate. Hymenium white then creamy, later alutaceous and cracking on drying, rather poroid or finely papillate and silky-setose. Context greatly variable in thickness.

Basidia: cylindric, 33 \times 5-6 μ , somewhat fasciculate.

Spores: hyaline, smooth, cylindric, one side often flattened or curved, 3-5 \times 9-11 μ , with granular or guttulate contents.

Cystidia: cylindrical, $8-11 \times 100-150~\mu$ (or longer), included or emergent up to about $40~\mu$, septate, often with clamps at the septa, fairly thin-walled, hyaline, frequently encrusted with detersile mineral matter, arising deep in the subhymenium or midtrama as lateral branches of the hyphae.

Hyphae: subhymenial hyphae $2 \cdot 5 - 3 \cdot 5$ μ wide, hyaline, much branched, septate, with scanty clamp connections, frequently collapsed or indistinct. Basal hyphae similar but seldom collapsed and up to 6-8 μ wide, thin-walled.

Specimens examined: van der Byl (1461), on dry Eucalyptus poles, Tzaneen, Transvaal, July, 1925.

The species is very variable in colour, thickness, and convolution of the hymenium. The South African collection cited above is a small one in which the fungus is thin and of a uniform creamy colour. Otherwise it corresponds very well with British material of which I have made numerous collections.

The collection, v. d. Byl (1496), Woodbush, Transvaal, cited as *P. setigera* in Nel, Ann. Univ. Stellenbosch 20 (1942) 91 has been examined in Herb. Kew. and proves to be a species of *Grandinia*.

The septate cystidia of P. aspera are highly distinctive. Other British species which have septate cystidia are P. pallidula (Bres.) Bourd. and Galz., P. tomentella Bres. and P. byssoidea (Pers. ex. Fr.) Höhn. and Litsch., but in all these the cystidia are much smaller and not above about 6 μ in width.

In a young condition, where some of the cystidia are still unseptate and with dense contents, *P. aspera* approaches very closely the form of *Corticium roseo-cremeum* Bres.

3. Peniophora arenata Talbot apud Wakefield and Talbot in Bothalia 4 (1948) 944, fig. 4.

Resupinate, widely effused, membranous or pellicular, easily separable when moist, cracking on drying revealing a whitish fibrillose subiculum, orbicular when young. Margin whitish, fibrillose. Hymenium light sandy-buff colour, pruinose to farinaceous and finely granular. Context white, up to 300 μ in thickness.

Basidia: clavate, $3-5 \times 23-30 \mu$.

Spores: hyaline, smooth, cylindric, $2 \cdot 5 - 3 \times 6 - 8 \mu$, apiculate-attenuate at one end, usually slightly curved.

Cystidia: immersed, rarely projecting beyond the hymenium, cylindrical, thick walled, very heavily encrusted, attenuated gradually at the base into a long hypha-like cystidiophore originating in mid-trama, sometimes forking briefly at the apex, sometimes closely grouped in fascicles, $6-10 \times 50-120 \ \mu$.

Hyphae: distinct, hyaline, rigid, thick-walled, with very sparse clamp connections, in a dense basal horizontal layer and a rather looser semi-vertical layer near the hymenium, frequently septate, sometimes encrusted, 3-6 μ wide. The basal hyphae are stouter and thicker walled than the superior hyphae.

Specimens examined: 27645, Type, Rump (34), Cato Ridge, Natal, 1934; 28916, Doidge and Morgan, nr. Donnybrook, Feb. 1935; 28891, Bottomley, The Cavern, Drakensberg, Natal, 20/7/37; 35314, Rump (733), Champagne Castle, Natal, Feb. 1945; 33209, Doidge and Bottomley, Wolhuterskop, Boschfontein Kloof, Transvaal, 5/5/39; Rump (625), Table Mountain, Natal, 1935.

The hymenium of this species, with its sandy appearance both in texture and colour, is distinctive. Microscopically, *P. arenata* should be grouped with *P. leprosa* Bourd. and Galz. The latter differs especially in having cystidia which are more frequently emergent and often tapering towards the apex, and also in having a distinct basal layer of thick-walled, heavily encrusted hyphae. In both species the cystidia are long and roughly cylindrical, heavily encrusted, showing a tendency to fork or fragment, and arise from a hypha-like base but are sharply differentiated from hyphae.

4. Peniophora Roumeguerii (Bres.) Burt in Ann. Mo. Bot. Gard. 12 (1925) 270; Bourdot and Galzin, Hym. de Fr. (1928) 316.

Corticium Roumeguerii Bresadola, Fung. Trident. 2 (1892) 36; Sacc. Syll. Fung. 11 (1895) 125.

Kneiffia Roumeguerii (Bres.) Bresadola in Ann. Myc. 1 (1903) 103.

Corticium Mollerianum Bresadola in Saccardo, Soc. Brot. Bol. 11 (1892) 13.

Peniophora Molleriana (Bres.) Saccardo, Soc. Brot. Bol. 11 (1892) 13; Saccardo, Syll. Fung. 11 (1895) 128; Bourdot and Galzin in Bull. Soc. Myc. de Fr. 28 (1912) 401; Wakefield in Trans. Brit. Myc. Soc. 5 (1915) 132; Rea, Brit. Basid. (1922) 693.

Peniophora macra Karsten. [Fide Bourd. and Galz. l.c. (1928)].

Peniophora stratosa Burt in Ann. Mo. Bot. Gard. 12 (1925) 333, nec. P. stratosa Petch in Ann. Roy. Bot. Gard. Peradeniya 9 (1925) 293 [fide Rogers and Jackson in Farlowia 1 (1943) 324].

Illustrations: Bresadola, Fung. Trident. 2 (1892) Pl. 144, f. 1.

PLATE 14.

Resupinate, widely effused, very adnate, membranous, brittle when dry, cream to chamois or biscuit colour, much cracked when dry, smooth or sometimes a little tuberculate. Hymenium at first rather pruinose, later with a waxy aspect. Margin narrow, whitish, pruinose to finely pubescent. In section up to 700 μ thick.

Basidia: narrow, cylindric-clavate, $3-5 \times 12-20-30 \mu$.

Spores: $3 \times 5.5 \mu$, ovoid-oblong, sometimes more elliptical, briefly and obliquely attenuated at the base.

Cystidia: very numerous, scattered throughout the trama, only a few emergent, thickwalled, encrusted, subconical or fusiform with acute apex, occasionally much fragmented, 10– 16×50 – 70μ .

Hyphae: erectly arranged, thin-walled, hyaline, with frequent septa but no clamp connections, 3 μ wide, usually agglutinated and rather indistinct.

Specimens examined: 27764, *Rump* (115), Town Bush, Maritzburg, Aug. 1934; 27761, *Rump* (107), Town Bush, Maritzburg, Aug. 1934. (The latter without spores and in poor condition.)

In hyphal characters and in the possession of abundant, thick-walled, acutely pointed cystidia, *P. Roumeguerii* is closely allied to *P. gigantea* (Fr.) Massee and *P. pubera* (Fr.) Sacc., both of which differ from *P. Roumeguerii* in producing their cystidia only in the superior part of the trama and hymenium. *P. gigantea*, moreover, becomes horny on drying while the other two species remain brittle.

5. Peniophora filamentosa (B. and C.) Burt apud Coker in Elisha Mitchell Sci. Soc. Journ. 36 (1921) 162, Pl. 32, f. 5, 6; Burt in Ann. Mo. Bot. Gard. 12 (1925) 320; Bourdot and Galzin, Hym. de Fr. (1928) 311.

Corticium filamentosum Berk. and Curt. in Grevillea 1 (1873) 178; Saccardo, Syll. Fung. 6 (1888) 619; Massee in Journ. Linn. Soc. Bot. 27 (1890) 154.

Corticium Petersii Berk. and Curt. pro parte, in Grevillea 1 (1873) 177.

Peniophora unicolor Peck in N.Y. State Mus. Rept. 43 (1890) 66; Saccardo, Syll. Fung. 9 (1891) 239.

Corticium radicatum P. Hennings, Pilze Östafrikas (1895) 54; Saccardo, Syll. Fung. 14 (1899) 222 ? (see Höhnel and Litschauer in K. Acad. Wiss. Wien. Sitzungsb. 117 (1908) 1093.

Peniophora radicata (P. Henn.) Höhnel and Litschauer, loc. cit., p. 1092—see Saccardo, Syll. Fung. 21 (1912) 411.

Above synonymy after Burt (1925).

Illustrations: Burt (1921) loc. cit. Pl. 32, f. 5, 6.

PLATE 15.

Resupinate, membranous, easily separable from the substratum when moist, smooth, soft, typically yellow-buff colour (buffy citrine, Ridgway) or isabelline. Margin concolorous or paler, composed of radiating adpressed fibrils, often forming branched mycelial strands. Context concolorous, 150-400 μ thick. Reacting in KOH to produce a strong violet colour.

Basidia: cylindrical, 3–4·5 \times 28–38 μ .

Spores: $3.5-4.5 \times 2-2.8 \mu$, ellipsoid, hyaline, smooth.

Cystidia: arising as branches of the hymenial hyphae only, fusoid, cylindrical or subulate, fairly thick-walled, encrusted with granules which rapidly dissolve in KOH but not in lactic acid, immersed or projecting up to 40 μ beyond the basidia, $5 \cdot 7 - 9 \cdot 3 \times 35 - 65 \mu$.

Hyphae: hyaline, but encrusted with KOH-soluble coloured granules, with rare clamp connections, loosely intertexed, $2 \cdot 8 - 5 \cdot 6 \mu$, with appreciably thick walls but wide lumen.

Specimens examined: 35306, Rump (581), Botanical Gardens, Maritzburg, 1943; 12029, Dümmer (636), Kyagwe, Uganda, May 1915 (as P. radicata).

These specimens agree very closely in all particulars with Burt's description of the species. The vinous colour reaction with KOH is especially striking, as also are the soluble granular encrustation of the cystidia, and the small colourless spores. Mycelial strands, when present, are a useful pointer to the classification of the species in the group Radicatae of Bourdot and Galzin.

A vinous colour reaction with KOH is also a characteristic of *Polyporus rutilans* (Pers.) Fr. (= *P. nidulans* Fr.), a fungus with the same type of context, colour, hyphae and encrustation of hyphae, and spores, as *Peniophora filamentosa*. In *P. rutilans* the hyphae are 2-5 μ diam., with thin to thickish walls and sparse clamps; the spores are ellipsoid, smooth, hyaline to faintly coloured, 3-5 \times 2-2·7 μ . There is surely a very close relationship between these two species, which in present classifications are held so far apart.

6. Peniophora gigantea (Fries) Massee in Journ. Linn. Soc. Bot. 25 (1889) 142; Karsten in Finska. Vet.-Soc. Bidr. Nat. och Folk 48 (1889) 422; Bresadola in I.R. Accad. Agiati Atti, iii, 3 (1897) 113; Bourdot and Galzin, Hym. de Fr. (1928) 318, Bull. Soc. Myc. de Fr. 28 (1913) 401; Rea, Brit. Basid. (1922) 693; Burt in Ann. Mo. Bot. Gard. 12 (1925) 216.

Thelephora gigantea Fries, Obs. Myc. 1 (1815) 152, Syst. Myc. 1 (1821) 448.

Corticium giganteum (Fr.) Fries, Epicr. Syst. Myc. (1838) 559, Hym. Eur. (1874) 648; Peck in N.Y. State Mus. Rept. 28 (1876) 52; Saccardo, Syll. Fung. 6 (1888) 610.

Thelephora pergamenea Pers., Myc. Eur. 1, p. 150 (fide Bourd. and Galz.).

Illustrations: Fries, Icones Hym. 2, Pl. 197, fig. 3.

PLATE 16.

Resupinate, widely effused on coniferous wood and bark, white or hyaline when fresh, smooth, waxy, easily separable from the substratum; contracting on drying to an easily detachable, horny or parchment-like layer, coloured whitish to buff or pink-buff. Margin white, radiately fibrillose. Context pale coloured when dry.

Basidia: cylindrical, $27-30 \times 3.5-4.3 \mu$.

Spores: (not seen with certainty in South African material), $2.5-4 \times 4-6.5 \mu$, oblong-subcylindric, attenuated at the base briefly and obliquely.

Cystidia: occupying a narrow zone confined to the hymenium and subhymenium, colourless, thick-walled, heavily encrusted with minerals, fusiform or conical, $10-11\cdot5\times36-80~\mu$.

Hyphae: hyaline, vertically arranged and indistinct except near the substratum where they are more horizontal, gelatinously modified thus usually only the lumen is visible, thick walled, with rare clamps, $(3)-6-(8) \mu$ in width.

Subhymenial hyphae are thin-walled, about 2.7μ wide.

Specimens examined: 30854, Hillman Bros. Ltd., on pitch pine wood, Lourenco Marques, P.E. Africa, 5/10/1939; 32176, Weintroub and Simpson (T.R.L. 1313), on bark of Pinus sp., Exchange Yard, Johannesburg, 10/9/1940.

Particularly characteristic of this species are its occurrence on conifers, its waxy texture becoming corneous when dry, its fibrillose margin which lifts and curls on drying, and the cystidia confined to the outer part of the fructification. The two specimens cited above were both collected in timber yards and were most probably imported to Southern Africa.

PENIOPHORA SPECIES RECORDED FOR SOUTH AFRICA, BUT NOT AVAILABLE FOR STUDY.

cinerea (Fr.) Cooke; v. d. Byl in Ann. Univ. Stellenbosch 7 (1929) 16. [As Corticium cinereum Fr. recorded in: Kalchbrenner in Grev. 10 (1881) 59; De Thümen in Flora 61 (1878) 354; Wood in Rept. Natal Bot. Gard. (1898) 17.]

The author has examined several South African specimens misdetermined as *P. cinerea*, including 22044, P. MacOwan (1054), which is actually *Stereum umbrinum* B. and C.

cremea Bresadola; v. d. Byl (1929) l.c., p. 16 and in S.A. Journ. Sci. 23 (1926) 288; Burt in Ann. Mo. Bot. Gard. 12 (1925) 263. Several collections of *P. pelliculosa* sp. nov., in Herb. Pretoriae, were misdetermined as *P. cremea*.

glebulosa Bresadola; v. d. Byl (1929) l.c., p. 15 and in S.A. Journ. Sci. 23 (1926) 288. nuda (Fr.) Bresadola; v. d. Byl (1929) l.c., p. 17. [As Corticium nudum Fr. recorded in: Kalchbrenner in Grev. 10 (1881) 59; Wood in Rept. Natal Bot. Gard. (1898) 17.]

PUNCTULARIA Patouillard.

1. Punctularia affinis (Berk. and Curt.) comb. nov.

Reticularia affinis B. and C. ! in Journ. Linn. Soc. Bot. 10 (1869) 347, Saccardo, Syll. Fung. 7 (1888) 418.

Reticularia venulosa B. and C. ! in Journ. Linn. Soc. Bot. 10 (1869) 347.

Reticularia atro-rufa B. and C. ! in Journ. Linn. Soc. Bot. 10 (1869) 347; Saccardo, Syll. Fung. 7 (1888) 419.

Thelephora atropurpurascens B. and Br. in Jour. Linn. Soc. Bot. 14 (1875) 64; Saccardo, Syll. Fung. 6 (1888) 546.

Punctularia atropurpurascens (B. and Br.) Petch in Ann. Roy. Bot. Gard. Peradeniya 6 (1916) 160.

Trichosporium Curtisii Massee in Jour. Myc. 5 (1889) 185, t. 14, f. 3; Saccardo, Syll. Fung. 10 (1892) 583.

Ceriomyces venulosus (B. and C.) Torrend in Bull. Soc. Portug. Sci. Nat. 4, p. 9. Corticium? tuberculosum Pat. in Bull. Soc. Myc. de Fr. 8 (1892) 118; Saccardo, Syll. Fung. 11 (1895) 126.

Punctularia tuberculosa (Pat.) Pat. in Bull. Herb. Boiss. (1895) 57; Saccardo, Syll. Fung. 14 (1899) 223; Patouillard, Essai sur les Hym. (1900) 57, f. 40.

Illustrations: Massee (1889) loc. cit. (as Trichosporium Curtisii); Patouillard (1900) loc. cit. (as Punctularia tuberculosa).

(conoidial stage); fig. 2 (perfect stage).

PLATE 17, fig. 1 (conidial stage); fig. 2 (perfect stage).

(a) CONIDIAL STAGE: Loose, floccose, pulvinate, or irregular tufts of hyphae. Coloured Dauphin's violet and greyish violet-blue to dark plum-purple or bluish violet-black (Ridgway). "At first lavender with a white margin, then lavender to greyish blue in the centre and reddish purple outwards. They finally collapse into a purple brown mass of matted hyphae and spores."—(Petch, 1.c.).

Hyphae: frequently adherent in easily seen strands, $2-2\cdot 5-(3)$ μ diam., lightly coloured in the microscope, purplish with the naked eye, thin-walled, with clamp connections and septa. Some hyphae appear to be minutely sculptured.

Conidia: purple-brown, globose, ovate or somewhat elliptical, much variation in shape, 4 μ diam., 5-6·6 \times 4 μ , or 8 \times 4 μ ; smooth. (Petch, loc. cit., states that the conidia are minutely verrucose, at first borne terminally, then laterally.)

(b) PERFECT STAGE: Not yet seen in South African material. The description below is drawn from Petch's Ceylon specimens in Herb. Kew.

Thin, effused, resupinate, occasionally radially grooved; centre subgelatinous; margin byssoid; drying horny and crustose. "General colour vinous, purplish in the centre and reddish elsewhere; margin white; centre covered with close-set pulvinate elevations, sometimes radially elongated."—(Petch, l.c.). In section the abhymenial

layer is seen to consist of dark, fuscous hairs, arising from a dark basal seam. Hairs thin-walled, fuscous, with clamps, 2-3-(4) μ wide, densely interwoven. Middle layer hyaline, with hyphae which are indistinct through gelatinisation. Upper layer light brown, subgelatinous. No hymenial elements can be clearly distinguished. There is an abundance of mineral matter in the troughs surrounding the papillae of the "hymenium," and in concretions throughout the trama.

- Specimens examined: 35015 (T.R.L. 2052), Simpson and Talbot, on Olea laurifolia, Qudeni, Zululand, Feb. 1945; 30068, Bower, on Copaifera mopane, Louis Trichardt, Tvl.; T.R.L. 359, details missing; 33429, Phillips, Krugersdorp, 21/3/1942 (as Trichosporium? purpureum Massee); 36862, Talbot, Fountains Valley, Pretoria, 29/8/48.
 - As Punctularia atropurpurascens (B. and Br.) Petch: Conidial: Peradeniya, Ceylon, Petch Oct. 1917; Petch (4328) 1914. Immature perfect stage: Herb. Perad. (4676) 1915.
 - As Reticularia affinis B. and C. ! 3012, Car. Inf.; 454, Cuba, C. Wright; 1043, Ravenel, S.C.
 - As Reticularia atro-rufa B. and C.! Herb. Hook. 1867, Cuba; Brazil, sine loc.; Glaziou, Rio de Janeiro, 1876 (8540); Cuba, C. Wright (534); Peradeniya, Thwaites (17), Nov. 1867.
 - As Reticularia venulosa B. and Br. ! Cuba, C. Wright (675); Fungi Cubenses Wrightiani (524).
 - As Punctularia tuberculosa (Pat.) Pat. on Olea Europea, R. Maire Myc. Boreali Africani (112), 1913.
- In S.A. Journ. Sci. 42 (1946) 133, Simpson and Talbot listed No. 35015 incorrectly as *Ptychogaster* sp.

Reticularia pyrrhocreas! is a fungus with a similar conidial structure, but with larger, red-brown conidia. It is said to have been used by Red Indians as a face powder.

ALEURODISCUS Rabenhorst.

1. Aleurodiscus acerinus (Pers.) Hohnel and Litschauer var. longisporus Hohnel and Litschauer! in K. Akad. Wiss. Wien. Sitzungsb. 116 (1907) 805, Pl. 2, f. 4; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 25.

Aleurodiscus acerinus var. alliaceus (Quél.) Bourd. and Galz. in Bull. Soc. Myc. de Fr. 28 (1912) 352; Pilát in Ann. Myc. 24 (1926) 217.

Corticium alliaceum Quélet, Fl. Myc. de Fr. (1888) 5; Saccardo, Syll. Fung. 6 (1888) 629.

As "Stereum acerinum Pers. var. longisporum Höhnel and Litschauer" in Saccardo, Syll. Fung. 21 (1912) 388.

Illustrations: Höhnel and Litschauer (1907) loc. cit.

PLATE 18.

Type: MacOwan (1074), Promont. bonae spei, Somerset East, in cortice arborum varium, 1875.

Resupinate, crustose, adnate, chalk-white becoming pallid ivory-white, finely and closely cracked in herbarium specimens; in section $80-100 \mu$ thick.

Basidia: clavate with a wavy outline, $35-45 \times 5-7 \mu$, not in a continuous palisade, exceeded by the branched hyphae from beneath.

Spores: not seen (see note below).

Hyphae: 2μ or less in width, hyaline, erect, much branched and closely arranged in the basal part, emerging as racemosely branched paraphyses between and beyond the basidia; very heavily encrusted with amorphous mineral matter.

Specimens examined: 21947, De Thumen Myc. Univ. (807) as Corticium calceum Fr. var. lacteum Fr., MacOwan (1074); 20840, Fungi MacOwaniani No. 1074, as C. calceum Fr., In cortice vivo arborum frondosarum in sylvis ad pedem montis Boschberg prope Somerset East. Febr. LXXV; 27566, Louwrens, Fountains Valley, Pretoria, 16/4/1934; MacOwan, Cap. B. Sp. 9/83 ex Herb. Kalchbrenner in Herb. Kew,

The entire fructification is so heavily impregnated with minerals that treatment of sections with strong HCl is necessary in order to make out the structure. Sections treated with HCl and then rinsed with water and mounted on KOH-phloxine were most satisfactory. Lactophenol will not dissolve the mineral matter.

The author was unable to find spores in the South African material which he examined. The assignation of these specimens to the variety *longisporus* is therefore in some doubt, but it seems reasonable in view of the fact that the Cape Province is the type locality of the variety. The variety *A. acerinus* var. *longisporus* was founded on de Thümen Mycotheca Universalis Exsicc. No. 807 (as *Corticium calceum* var. *lacteum* Fr.), a collection of MacOwan from Somerset East, the distinction being purely a small difference in spore measurement. (See Table 2.)

TABLE 2. SPORE MEASUREMENTS OF A. acerinus and its Varieties.

Fungus Name.	Spore Measurements in μ .	Observer.
A. acerinus	10-13×6-7	Höhnel and Litschauer
A. acerinus var. longisporus	12-17×4-6	Höhnel and Litschauer
	12-20×8-9	v. d. Byl.
A. acerinus var. alliaceus	10-16×5-8	Bourd. and Galz.
i i	12-17×4·5-7	Pilát.

On the above observations of spore size and shape there appears to be an intergrading between A. acerinus and A. acerinus var. longisporus which indicates that it may not be practicable to hold them apart when more collections come to light.

A MacOwan collection from Somerset East also reached Kalchbrenner and was recorded in "Fungi MacOwaniani" [Grev. 10 (1881) 59] as Corticium calceum Fr. That collection, or part of it, is in Herb. Kew now. Montagne [in Ann. Sci. Nat. 3 ser., 7 (1847) 175] and de Thümen [in Flora 61 (1878) 353; ibid. 59 (1876) 363] also record Corticium calceum or its variety lacteum from MacOwan's Somerset East collections. These collections may be summarised thus:—

- (a) MacOwan, Cap. B. sp. 9/83, determined as Corticium calceum Fr. by Kalchbrenner. (Specimen seen, and is Aleurodiscus acerinus or var. longisporus.)
- (b) MacOwan (9452, b), Samteesvlakte prope Enon; published by Montagne as C. calceum Fr.
- (c) MacOwan (1032), Somerset East; published by de Thümen as C. calceum Fr.
- (d) MacOwan (1074), Somerset East; published by de Thümen as C. calceum Fr. var. lacteum Fr., and later made the type of Aleurodiscus acerinus var. longisporus by Höhnel and Litschauer.

From the Cape Province also, is a collection by Drège (Mus. Paris 9452) which Léveille published as *Thelephora* (*leijostroma*) acerina Pers. [in Ann. Sci. Nat. ser. 3, 5 (1846) 150].

Corticium calceum Fr., even in the restricted sense of Romell and Burt [Burt in Ann. Mo. Bot. Gard. 13 (1926) 203] has been shown by Rogers and Jackson [in Farlowia 1 (1943) 284] to be a nomen confusum which should be rejected. Most records of "Corticium calceum" in South Africa probably refer to Aleurodiscus acerinus var. longisporus. In van der Byl's account of the South African Thelephoraceae [Ann. Univ. Stellenbosch 7 (1929)], C. calceum and A. acerinus var. longisporus are dealt with separately, and it is therefore not clear what fungus is represented by v. d. Byl's concept of C. calceum.

For future convenience in deciding whether A. acerinus var. longisporus should be recognised as a distinct variety, the most important literature references to the species A. acerinus are appended:—

Aleurodiscus acerinus (Pers.) Höhnel and Litschauer in K. Akad. Wiss. Wien Sitzungsb. 116 (1907) 804; Bourdot and Galzin, Hym. de Fr. (1928) 334; Burt in Ann. Mo. Bot. Gard. 5 (1918) 196; Pilát in Ann. Myc. 24 (1926) 216.

Corticium acerinum Persoon, Obs. Myc. 1 (1796) 37; Romell, Bot. Not. (1895) 71.

Thelephora acerina (Pers.) Pers., Syn. Fung. (1801) 581, Myc. Eur. 1 (1822) 152; Fries, Syst. Myc. 1 (1821) 453, Hym. Eur. (1874) 648; Léveille in Ann. Sci. Nat. ser. 3, 5 (1846) 150.

Stereum acerinum (Pers. ex Fr.) Fr., Epicrisis (1838) 554; Saccardo, Syll. Fung. 6 (1888) 587; Massee in Journ. Linn. Soc. Bot. 27 (1890) 202; Petch in Ann. Roy. Bot. Gard. Perad. 6 (1916) 157.

Hypochnus acerinus (Pers.) Pat. in Rev. Myc. (1889) 166, Bull. Soc. Myc. Fr. 5 (1889) 30.

Illustrations: Hhönel and Litschauer (1907) loc. cit., Tab. 2, f. 6.

ALEURODISCUS SPECIES RECORDED FROM SOUTH AFRICA BUT NOT AVAILABLE FOR STUDY:

cerussatus (Bres.) Höhnel and Litschauer; Van der Byl in Ann. Univ. Stellenbosch 7 (1929) 25.

disciformis (DC) Patouillard; Van der Byl (1929) loc. cit., p. 24.

PHLEBIA Fries.

1. Phlebia strigoso-zonata (Schwein.) Lloyd in Lloyd Myc. Writ. 4 (1914) L. 53: 15; Burt in Ann. Mo. Bot. Gard. 8 (1921) 394.

Merulius strigoso-zonatus Schweinitz in Trans. Amer. Phil. Soc. n.s. 4 (1834) 160. Auricularia strigoso-zonata (Schwein.) Lloyd (as "McGinty") in Lloyd Myc. Writ. 4 (1913) L. 46:6.

Phlebia rugosissima Lév., Champ. Exot. in Ann. Sci. Nat. ser. 2, 3 (1844) 214; Saccardo, Syll. Fung. 6 (1888) 499.

Auricularia rugosissima (Lév.) Bres. in Ann. Myc. 14 (1916) 231.

Phlebia reflexa Berk. in Hook. Jour. Bot. 3 (1851) 168; Saccardo, Syll. Fung. 6 (1888) 500.

Auricularia reflexa (Berk.) Bres. (non A. reflexa Bulliard) in Ann. Myc. 9 (1911) 551; Lloyd, Myc. Writ. 5 (1918) L.67: 12.

Phlebia rubiginosa Berk. and Rav. in Ravenel Fasc. iii: 23, and in Grevillea 1 (1873) 146; Saccardo, Syll. Fung. 6 (1888) 499.

Phlebia zonata Berk. and Curt. in Grevillea 1 (1873) 146; Saccardo, Syll. Fung. 6 (1888) 499.

Phlebia pileata Peck in 29th Ann. Rept. N.Y. State Mus. (1877) 45; Saccardo, Syll. Fung. 6 (1888) 499.

Phlebia hispidula Berk. in Journ. Linn. Soc. Bot. 16: p. 167; Saccardo, Syll. Fung. 6 (1888) 499.

Auricularia sordescens Cesati, Myc. Born. (1879) 10; Saccardo, Syll. Fung. 6 (1888) 764.

Stereum lugubris Cooke in Grevillea 12 (1884) 85; Saccardo, Syll. Fung. 6 (1888) 574.

Auricularia Butleri Massee in Kew Bull. (1906) 94; Saccardo, Syll. Fung. 21 (1912) 441; Banerjee in Bull. Bot. Soc. Bengal 1 (1947).

Illustrations: PLATE 19.

nections.

Resupinate-reflexed, becoming dimidiate, sessile, with imbricate pileoli. Margin strongly involute and of a lighter colour, yellow-ochre when freshly collected and moistened. Abhymenial surface densely tomentose, dark reddish-brown, deeply concentrically furrowed. Hymenium black when dry, reddish-black and somewhat gelatinous when moist, radially raised in minute ridges or pleats, concentrically furrowed in formation corresponding to the upper surface. Context dark. Pileate parts 3–6 cms. in length. Reported by one collector to have a faint cocoa smell when fresh.

Basidia: cylindric-clavate, $(3)-3\cdot5-4\cdot3\times(16)-31-36~\mu$, in very tight palisade. None seen with sterigmata.

Spores: not seen ["hyaline, obovoid, 9-10 \times 5 μ ," fide Bresadola in Ann. Myc. (1911) loc. cit.]

Tissue differentiation: 600 μ thick, excluding the much thicker tomentum; Hymenium composed of a thin dark layer of hyphae covered externally with minute dark globose granules. Next to the tomentum is a thick, black zone. Middle layers composed of fine filamentous hyphae, rather indistinct and gelatinised. (Bresadola, loc. cit., states that the hyphae are $2-4\cdot 5 \mu$ wide, hyaline, with clamp connections.) Surface hairs: fuscous; $3-5 \mu$ wide, rather thick-walled, with abundant clamp con-

Specimens examined: 27646, Rump, Town Bush, Maritzburg, 1934; Ledeboer, on wattle stump, nr. Maritzburg, Jan. 1945; 36700, Talbot, on Acacia mollissima stump, Lions River, Natal, 17/5/1948; 36695, Talbot, on Acacia mollissima, Byrne, Natal, 24/5/1948.

As the basidia in this species are difficult to see and, when seen, are very rarely mature, the genus has always been in doubt. Burt (1921) states that the species is a Eubasidiomycete and cannot be placed in Auricularia. Bresadola described the basidia as "cylindric-subclavate, $30-35 \times 4-5 \mu$ " but placed the species in Auricularia. In several specimens which the author examined in Kew and in Pretoria, no septate basidia were seen, but admittedly all were immature. On account of the holobasidia he places the species in Phlebia, while realising that the effuso-reflexed, subgelatinous pileus does not fit in well with this genus.

The species is widely distributed in the Far East, Australia, New Zealand and America, but is not found in Europe.

MERULIUS Haller ex Fries.

Key to species described:—

- 1. Hymenium light buff with fleshy tint when old; spores colourless, subcylindrical, about $2 \cdot 5 3 \cdot 5 \times 6 7 \cdot 5 \mu$ *M. corium* (1).
- 2. Hymenium dark coloured when old, reddish brown; spores coloured, elliptical, about 5-6.5 \times 8-11.6 μ_*
 - a) Young hyphae often with pale lilaceous tint; hyphae with infrequent clamp connections and frequent ampoule-swellings; no rapid colour change when moistened

 M, himantioides (2).
 - aa) Young parts without lilaceous tint; hyphae with frequent clamps but no marked ampoules; when moistened there is a rapid colour change from dresden brown to bright russet, also becoming slightly gelatinous; hyphae frequently finely encrusted M. gelatinosus (3).

Merulius corium (Pers. ex Fries) Fr., Elenchus Fung. 1 (1828) 58, Epicr. (1838) 500, Hym. Eur. (1874) 591; Rea, Brit. Basid. (1922) 620; Saccardo, Syll. Fung. 6 (1888) 413; Burt in Ann. Mo. Bot. Gard. 4 (1917) 322; Donk, Rev. Nederl. Heterobas. en Homobas.—Aphyllophoraceae 1 (1931) 155; Kalchbrenner in Grev. 10 (1881) 57; Lloyd, Myc. Writ. 6 (1920) 952; Nel in Ann. Univ. Stellenbosch 20 (1942) 77.

Thelephora corium Persoon, Syn. Meth. Fung. (1801) 574; Greville, Scot. Crypt. Fl. 3 (1825) tab. 147.

Thelephora incarnata var. β Persoon, Myc. Eur. 1 (1822) 131.

Auricularia papyrina Bulliard, Champ. de la Fr. (1780-1784) Pl. 402; Sowerby, Eng. Fung. 3 (1803) tab. 349.

Merulius papyrinus (Bull.) Quélet, Fl. Myc. de Fr. (1888) 32; Bourdot and Galzin, Hym. de Fr. (1928) 347.

Boletus purpurascens De Candolle, Fl. Franc. 6 (1815) 41.

Polyporus purpurascens (DC.) Persoon, Myc. Eur. 2 (1825) 60.

Illustrations: Greville (1825) 1.c., tab. 147; Burt (1917) 1.c., f. 7.

PLATE 20.

Resupinate, effused, at first orbicular, membranous-ceraceous, soft, thin, in section $300-500~\mu$. Margin eventually lifting, narrow, showing a narrow, whitish, villose, sometimes sulcate, reflexed surface. Hymenium in early stages and near margin smooth, becoming poroid with small shallow reticulations, about 2 per mm., drying buff with often a fleshy pink tint.

Basidia: cylindrical, narrow, densely aggregated, $2 \cdot 5$ -4 \times 24-33 μ ; sterigmata 2-4, straight, narrow, up to 4 μ long.

Spores: not seen in South African specimens; hyaline, subcylindric, smooth, $2 \cdot 5 - 3 \cdot 5 \times 6 - 7 \cdot 5 \mu$ (see note on spore size, below).

Hyphae: subhymenial hyphae thin walled, hyaline, branched, with numerous septa, 2-4 μ wide, with or without accompanying mineral matter in the form of small granules. Basal hyphae thicker—walled, hyaline, branched, septate, 3-6 / wide. All hyphae very distinct and forming a fairly loosely interwoven network, lacking clamp connections. The thick-walled hyphae appear to be merely older hyphae, not a specialised skeletal system.

Specimens examined: 28885, Bottomley, The Cavern, Drakensberg, Natal, 20/7/37; 31725 (N.H. 391), Klapmuts, Cape, Dec. 1916; 26654, Stephens (158), Kuils River, Cape, Sept. 1932; 1350, Doidge, Garstfontein, Pretoria Dist., 11/4/1911; Rump (625), Table Mountain, Natal, 1935; Dr. Holub, "Interior of South Africa," (in Herb. Kew).

Merulius confluens Schweinitz is recorded for South Africa by Nel [in Ann. Univ. Stellenbosch 20 (1942) 77], but the author has not yet been able to consult this specimen in the van der Byl Herbarium. M. confluens is extremely near to M. corium and is held as synonymous by Lloyd [in Lloyd, Myc. Writ. 3 (1909) 422 and ibid. 4 (1914) L. 52: 8] to which opinion I subscribe after examining some of the American specimens of M. confluens in Herb. Kew, not, however, including the Type, and numerous of my own collections of M. corium. Burt (1917, l.c., p. 319) writes, "M. confluens has the general aspect of M. corium but is distinguished from that species by frequently a more broadly reflexed margin, which is shallowly, concentrically sulcate when broadly reflexed, by larger and usually deeper pores, by the incrusted hyphae of the subhymenial region and by the small spores."

As there is some variation in spore size between European and American specimens of *M. corium*, Burt (l.c., p. 323) emphasises the incrustation of hyphae in *M. confluens* as a clear-cut diagnostic character. This is a most uncertain character: in specimens

of *M. corium* collected in England, and those in Herb. Kew, there is often much mineral matter in the subhymenium so that the hyphae appear encrusted. Spore size is not a reliable character, for in *M. corium* it is very variable and is generally greater than that of *M. confluens* except in America, where, according to Burt's descriptions the spores of the two have almost identical measurements. Spore sizes in these two species are indicated in the accompanying table (see Table 3).

Macroscopic variations in *M. corium* are sufficient to embrace all the supposed points in which *M. confluens* is held to differ. The author would suggest that typically the two species represent extremes of a graded series, but without seeing authentic material of them one cannot formally propose *M. confluens* as a synonym of *M. corium*.

TABLE 3.

SPORE SIZES OF SOME Merulius SPECIES.

Species.	Country.	Spore Size in μ .	Observer.
M. confluens M. confluens	America	4·5-5×2·5 4·6×2-2·5	Burt. Talbot.
M. corium	America	4·5-5×1·75-2·5	Burt.
M. corium	Europe	6-7×3	Burt.
		6-12×2·5-4	Bresadola and Brinkmann.
		5-6-8×2·5-3-4	Bourdot and Galzin.
M. corium	England	6-6·6×3·5	Talbot.

- Merulius himantioides Fries!, Syst. Myc. 1 (1821) 329, Epicr. (1838) 501, Hym. Eur. (1874) 592; Saccardo, Syll. Fung. 6 (1888) 415; Burt in Ann. Mo. Bot. Gard. 4 (1917) 349; Rea, Brit. Basid (1922) 623.
 - Gyrophana himantioides (Fr.) Bourd. and Galz. in Bull. Soc. Myc. de Fr. 39 (1923) 13, Hym. de Fr. (1928) 354.
 - Merulius tenuis Peck in N.Y. State Mus. Rept. 47 (1894) 147; Saccardo, Syll. Fung. 11 (1895) 105 (fide Burt).
 - Merulius umbrinus Fries, Elench. Fung. 1 (1828) 61 [fide Lundell and Nannfeldt, Fungi Exsicc. Suecici (1941) No. 1014].
 - Merulius squalidus Fries, Elench. Fung. 1 (1828) 62 [fide Lundell and Nannfeldt, Fungi Exsicc. Suecici (1941) No. 1014]; Fries, Hym. Eur. (1874) 594; Saccardo, Syll. Fung. 6 (1888) 420, ibid 23 (1925) 465; Rea, Brit. Basid. (1922) 623; Bresadola in Ann. Myc. 18 (1920) 69; Lloyd, Myc. Writ. 4 (1914) L. 52: 26.
 - Illustrations: Fries, Icones Hym. (1877-1884) Pl. 192, f. 1; Romell in Arkiv. för Bot. 11² (1911) 28, Pl. 2, f. 19 (as *M. himantioides*).

PLATE 21, fig. 1.

Effused, resupinate, occasionally a little reflexed, dry, brittle. Hymenium spread over gyrose plicate folds which are almost poroid in places, or elsewhere bluntly toothed, irpiciform, or labyrinthiform; when dry, umber to warm Brussels Brown colour, when moistened turning a warmer, darker colour. Margin thin and dingy white, pale buff, or with a distinct lilac tinge, soft, sometimes produced in places into short rhizoidal strands. Context pale coloured, somewhat floccose, in section 300–500 · thick.

Basidia: cylindric-clavate, (5·3) 8-11 \times (33)-44 (60) μ , with four sterigmata up to 5 μ long.

Spores: $5-6.5 \times 8-10.6~\mu$, light yellow colour, broad elliptic, often with one side flattened, smooth, often 1-2 guttulate.

Hyphae: of two kinds, hyaline or coloured, the types differing only in colour. Hyphae thin-walled, not encrusted, with frequent large clamp connections and occasional H-anastomoses and ampoullar swellings, very frequently collapsed, closely intertexed, branched, very variable in width, $2-12~\mu$ wide.

Specimens examined: *Timber Research Lab.* (2090) on wattle pole near mouth of an adit in Elands Drift Mine, Sabie, E. Tvl. (Dry bulb 60° F., wet bulb 47° F.), 1945; T.R.L. (361), *Henderson*, on old beam of wood on the ground at Exchange Yard, Johannesburg, 1938; 36730, *Louwrens*, Wynberg Park, Wynberg, 19/6/48.

As M. squalidus: Exsicc. W. Brinkmann, Westfälische Pilze iii: No. 121; 24861, Stephens, Westbrooke, Newlands C.P., June, 1929.

Bresadola [in Ann. Myc. 18 (1920) 69] reduces *M. squalidus* to a synonym of *M. umbrinus* which has page priority in the Elenchus Fungorum 1 (1828) 61. This treatment is substantiated by Lundell and Nannfeldt (loc. cit.) who include both these species as synonyms of *M. himantioides*, with the following notes: "The fresh colour of the subiculum was almost lilacino-roseus. It seems certain that this species reaches full development only in years with exceptionally large precipitation. Fries' original water colour drawing shows excellently a juvenile stage with margin still coloured, but the reproduction in Icon. Sel. Tab. 193: 1 has lost the colour and shows a white margin. It is only with increasing age that the margin turns whitish. Authentic material in Upsala Herb. shows *M. squalidus* Fr. and *M. umbrinus* Fr. to be synonyms. The former species represents a young stage, and the latter was described from the old over-ripe stage."

The South African specimen No. 24861 (as *M. squalidus*) is a close match with the Brinkmann Exsicc. No. iii: 121. Specimen T.R.L. 361 is a close match in all respects with *M. himantioides* as represented in the British Collection of Herb. Kew. The microscopic characters of T.R.L. 2090 are also the same, but macroscopically it has a more robust growth form and a hymenium which is more distinctly toothed than usual.

M. himantioides differs from the better-known M. lacrymans most notably in microscopic characters and habitat, but also in not being rather fleshy and rusty brown in colour. The spores of M. lacrymans are paler, narrower $[(4\cdot3)\cdot5-(6)\times10~\mu)$ and flatter, and its coloured hyphae are always thick-walled or even without a visible lumen, while its hyaline hyphae may be either thin- or thick-walled (see Plate 21, fig. 2).

M. lacrymans Wulf. ex Fr. has once been recorded in South Africa [v. d. Byl in Trans. Roy. Soc. S.A. 10 (1922) 285] occurring under the linoleum of an old house in Stellenbosch. This is an interesting record, for M. lacrymans is a fungus sensitive to high temperatures and dry conditions, and is usually only to be found in temperate regions. It is unlikely that M. lacrymans would flourish in the gold mines, for although the relative humidity is high, it is accompanied by high temperatures [cfr. Brown in S.A. Journ. Sci. 33 (1936) 383].

3. Merulius gelatinosus Lloyd! in Lloyd, Myc. Writ. 7 (1922) 1158, f. 2293, published by typographic error in part as "Merulius gelatinous"; non *M. gelatinosus* Petch! in Ann. Roy. Bot. Gard. Perad. 9 (1925) 315, published by typographic error as "Mesulius gelatinosus."

Illustrations: Lloyd (1922) loc. cit., f. 2293.

PLATE 22.

Resupinate, effused over old logs and forest debris. When dry, brittle, hymenium Dresden brown, almost smooth with only the faint outline of reticulations. When wetted, changing colour immediately to a bright warm russet and swelling into semi-

gelatinous convolutions of somewhat darker colour. Margin smooth, pale, yellowish buff. Thickness in section up to 2 mm. when dry; context pale coloured.

Basidia: $6.5-8 \times (36)-40-48 \mu$, with 4 curved sterigmata 4-5 μ long, clavate, hyaline.

Spores: (6)-6.5 \times 10-(11.6) μ , smooth, elliptical, bright yellow.

Hyphae: Subhymenial tissue pale coloured in mass but composed of hyaline and coloured hyphae; hyphae thin-walled, irregular in outline, frequently septate, branched, with frequent large clamp connections, $2-3\cdot 5$ μ wide. Nearer the base, the hyphae are hyaline or quite deeply coloured, frequently much encrusted, septate, branched, (2)-4-10 μ wide, with clamp connections. The tissues merge into one another and the three distinct layers of hyphae described by Lloyd (l.c.) were not seen.

Specimens examined: 31481, *Duthie*, on old logs and debris, Belvidere, Knysna, C.P., July 1921. (Probably authentic material.)

The distinctive points about this species are (1) the almost smooth hymenium when dry; (2) change of colour and texture on moistening (though the gelatinous consistency should not be over emphasised); (3) thin-walled, coloured or hyaline hyphae, with clamps, and encrusted in parts.

Except for the greater irregularity of outline, and encrustation, the hyphal characters are like those found in *M. himantioides*, though in the latter the clamp connections are usually rather infrequent. In *M. lacrymans* the hyphae lack clamps, are thick-walled and coloured.

M. gelatinosus Petch! is very different from M. gelatinosus Lloyd!, and being a later homonym the former species should be renamed.

SYNONYMS AND EXCLUDED SPECIES IN MERULIUS.

confluens Schweinitz = M. corium Pers. ex Fries, fide Lloyd in Myc. Writ. 3 (1909) 422 and ibid. 4 (1914) L. 52: 8.

squalidus Fries = M. himantioides Fries, fide Lundell and Nannfeldt, Fungi Exsicc. Suecici (1941) No. 1014.

umbrinus Fries = M. himantioides Fries, fide Lundell and Nannfeldt, loc. cit.

MERULIUS SPECIES RECORDED FOR SOUTH AFRICA BUT NOT AVAILABLE FOR STUDY:

confluens Schweinitz; Nel in Ann. Univ. Stellenbosch 20 (1942) 77.

lacrymans Wulf ex Fr.; van der Byl in Trans. Roy. Soc. S.A. 10 (1922) 285; Nel in Ann. Univ. Stellenbosch 20 (1942) 77.

serpens Fries; Kalchbrenner in Grevillea 10 (1881) 57.

CONIOPHORA DC. ex Persoon.

1. Coniophora papillosa Talbot apud Wakefield and Talbot in Bothalia 4 (1948) 939, f. 1. *Illustrations*: PLATE 23, fig. 1.

Type: Timber Research Lab. (1852), on timber, Venterspost Gold Mining Co., Ltd., 23/10/42. (In Herb. Kew.)

Resupinate, widely effused, adnate, circa 500 μ thick, brittle, occasionally cracked when dry. Hymenium dark drab colour, covered with small, hemispherical, discrete, fertile papillae of superficial origin. Context fuscous.

Basidia: very rarely seen, not in palisade, clavate-cylindric, hyaline, 23-30 \times 4-5 μ , at maturity projecting almost full length above the mass of tissue; sterigmata 2 or 4, short.

Spores: Elliptical or ovate, occasionally subglobose, coloured yellowish brown, smooth, $4-6\times7.5$ 10 μ , sometimes unilaterally flattened, rather thick-walled, sometimes guttulate, very numerous and embedded in the upper parts of the trama, hyaline when immature.

Tissue differentiation: Basal layers of trama composed of much interwoven, branched, very dark coloured hyphae, 2 μ wide, some dendroid but not markedly so. The remainder of trama composed of lightly coloured to hyaline tissue which is indistinct or in parts almost pseudoparenchymatous and is progressively darker from hymenium to substratum.

Specimens examined: Type, T.R.L. (1852), cited above; 30194, Rump (393), on indigenous wood in swamp bush, Compensation Beach, Natal, 1935.

Despite their very different habitats these two specimens are identical except that no basidia could be demonstrated in the Natal specimen. This *Coniophora* is very distinctive, particularly in the arrangement of the tissues. The hymenium has a characteristic colour and is more markedly papillate than is seen in other species. *C. sistrotremoides* (Schw.) Massee is described as papillate but is entirely different in other respects.

2. Coniophora fodinarum sp. nov. (Etym. fodina = a mine).

Illustrations: PLATE 23, fig. 2.

Type: 27558, R. Lurie (T.R.L. 81) on underground timbers, New Modder Mine, Johannesburg, 3/4/1934. Type in Herb. Kew, with Isotypes in Herb. Pretoriae and Herb. University of Toronto.

Resupinate, widely effused, readily separable from the substratum, brittle when dry, not cracking, up to 2 mm. in thickness. Hymenium very tubercular, coloured olivaceous umber, yellowish or raw umber. Abhymenial surface soft, velvety, dark brown. Context pale coloured. Rhizoidal strands may develop.

Basidia: not seen except in collapsed condition.

Spores: very variable in size, $5-6-6\cdot6\times6\cdot6-7\cdot5-8\cdot3-10~\mu$, and varying in shape from subglobose to elliptical with one side often flattened, usually the latter shape; coloured, smooth, relatively thin-walled, free or embedded among hyaline much branched, filamentous hyphae, in a layer up to 260 μ in thickness.

Hyphae: (1) of the spore-bearing layer: filamentous, hyaline, much branched, less than 1 μ diam. (2) Of the middle layers (500 660 μ thick), lightly coloured, 2 μ diam., densely intertexed with more filamentous hyphae which form a vague tissue. (3) Abhymenial hyphae, thin-walled, dark coloured, septate, not profusely branched, 3-(6) μ diam., forming a spongy layer over 250 μ in thickness.

Specimens examined: Type, 27558, cited above; 28857, R. Lurie, Randfontein Estates, Johannesburg, Jan. 1937; 24871, Wilman, on Acacia mollissima caps, River View Mine, Wedburg, C.P., 25/7, 1928; 28767, R. Brown (38), Jubilee Mine, T.G.M.E., Pilgrims Rest, E. Tvl., 19/10/1936.

This species differs from C. puteana (Schum. ex Fr.) Karst. in being easily separable from the substratum when dry, in its greater thickness, and particularly in the organisation of the hyphae and their deep colour in the basal layer. The spores are also very much smaller than those of C. puteana [(5·3) $6\cdot5-8\times9$ 12·14·7 μ in British collections]. The author has not seen examples of C. fumosa Karst., but the present specimens do not agree with the plate of this in Fries, Icones Tab. 198, f. 3, nor with the description in Saccardo, Syll. Fung. 6 (1888) 651. The especial differences are the arachnoid-membranous, adherent, smooth features of C. fumosa. Rogers and Jackson [in Farlowia 1 (1943) 273] reduce C. fumosa to synonymy with C. olivacea (Pers. ex Fr.) Karst. which is cystidiate and quite different from the new species proposed here. Dr. Jackson, of Toronto University, very kindly examined specimens of C. fodinarum at my request, and confirmed that it was probably undescribed, and unlike any species of Coniophora known to him. The species was formerly confused with C. puteana or C. fumosa in South African Herbaria.

3. Coniophora olivacea (Fries) Karsten in Bidr. Känned Finl. nat. o. Folk 37 (1882) 162; Saccardo, Syll. Fung. 6 (1888) 649; Massee in Journ. Linn. Soc. Bot. 25 (1889) 129; Bresadola in I.R. Accad. Agiati Atti iii, 3 (1897) 116; Burt in Ann. Mo. Bot. Gard. 4 (1917) 257; Rogers and Jackson in Farlowia 1 (1943) 273.

Hypochnus olivaceus Fries, Obs. Myc. 2 (1818) 282, pro parte.

Corticium (Hypochnus) olivaceum Fries, Hym. Eur. (1874) 660 pro parte.

Corticium (Coniophora) olivaceum (Fr.) Cooke in Grevillea 8 (1880) 89.

Coniophorella olivacea (Fr.) Karsten in Bidr. känned Finl. nat. o. Folk 48 (1889) 438; Bresadola in Ann. Myc. 1 (1903) 110; Bourdot and Galzin, Hym. de Fr. (1928) 362; Rea, Brit. Basid. (1922) 628; Lundell and Nannfeldt, Fungi Exsicc. Suecici. Uppsala. Fasc. XV–XVI (1939) No. 750.

Corticium leucothrix Berk. and Curt. in Grevillea 2 (1873) 4.

Corticium (Coniophora) leucothrix (B. and C.) Cooke in Grev. 8 (1880) 89.

Coniophora leucothrix (B. and C.) Cooke in Saccardo, Syll. Fung. 6 (1888) 648; Massee in Journ. Linn. Soc. Bot. 25 (1889) 133.

Corticium brunneolum B. and C. in Grevillea 2 (1873) 4.

Corticium (Coniophora) brunneolum (B. and C.) Cooke in Grevillea 8 (1880) 88.

Coniophora brunneola (B. and C.) Cooke in Saccardo Syll. Fung. 6 (1888) 648; Massee in Journ. Linn. Soc. Bot. 25 (1889) 134.

Hymenochaete Ellisii Berk. and Cooke in Grev. 4 (1876) 162.

Corticium (Coniophora) Ellisii (Berk. and Cooke) Cooke in Grevillea 8 (1880) 89.

Coniophora Ellisii (Berk. and Cooke) Cooke in Saccardo, Syll. Fung. 6 (1888) 648; Massee in Journ. Linn. Soc. Bot. 25 (1889) 129.

Coniophora fulvo-olivacea Massee in Journ. Linn. Soc. Bot. 25 (1889) 134; Saccardo, Syll. Fung. 9 (1891) 241.

Coniophora atrocinerea Karsten in de Thümen Myc. Univ. No. 1806 (1881); Soc. pro Faune et Flora Fennica Meddel. 6 (1881) 12; Finska Vet.-Soc. Bidrag Natur. och Folk 37 (1882) 162; Saccardo, Syll. Fung. 6 (1888) 650; Massee in Journ. Linn. Soc. Bot. 25 (1889) 132; Burt in Ann. Mo. Bot. Gard. 4 (1917) 260; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 17; Rogers and Jackson in Farlowia 1 (1943) 273 (fide Rogers and Jackson loc. cit.).

Coniophorella atrocinerea Karsten, Finl. Basidsv. (1889) 438; Bourdot and Galzin, Hym. de Fr. (1928) 364.

Coniophora fumosa Karsten Symb. 8 pg. 13; Saccardo Syll. Fung. 6 (1888) 651; Bourdot and Galzin, Hym. de Fr. (1928) 360; Höhnel and Litschauer, Beitr. der kennt. der Corticeen (1908) 16. (fide Rogers and Jackson, loc. cit.).

Corticium fumosum Fries pro parte, Fries, Icones Fung. tab. 198, f. 3.

Above synonymy after Burt, and Rogers and Jackson.

Illustrations: Trans. Brit. Myc. Soc. 6 pg. 73; Burt in Ann. Mo. Bot. Gard. 4 (1917) 258, f. 14.

PLATE 24.

Resupinate, widely effused, byssoid to membranous, cracking or remaining entire on drying, fragile, separable when fresh, somewhat adnate when dry, olivaceous, drying isabelline or brownish. Margin paler and byssoid or arachnoid when distinct. In section 100 150 μ thick (up to 1,300 μ thick according to v. d. Byl, l.c.).

Basidia: hyaline, cylindric, $6.5-10 \times 39-45 \mu$, with 2 4 sterigmata up to 8.5μ long. A few hyaline, simple paraphyses present, $3.5-4.2 \mu$ wide.

Spores: yellow-brown, smooth, with a distinct apiculus, often l-guttulate, elliptical with one side often depressed and narrowing towards the apiculus, (5)-6-7- $(8) \times (10)$ -12-13- $(14) \mu$.

Cystidia: numerous, cylindric with rounded apex and gradually tapered base, arising as lateral branch of subhymenial or mid-tramal hypha, brownish with paler apex, septate (almost hyaline when young and non-septate), relatively thin-walled, covered with large detersile crystals partly soluble in KOH, projecting 52–110 μ , in size $12-13 \times 100-150-(300)$ μ , usually about 140 μ long.

Hyphae: densely intertexed, clamps very rare, septate, not encrusted, much branched, $(2\cdot8)$ -4- $(5\cdot6)$ μ wide. Inferior hyphae brown, rather lax; superior hyphae brown, compact, mixed with some hyaline hyphae in the subhymenium. No marked differentiation of tissues.

Occurrence: usually on pine wood.

Specimens examined: 27665, Stephens (367), on base of pine stump near University Course, Rondebosch, C.P., June 1934; 32086, Weintroub (T.R.L. 1158), on badly decayed joist of flooring board, Exchange Yard, Johannesburg, 1940; 36823, A. A. Pearson (Stephens 650) on stumps of Pinus sp., Groot Constantia Woods, 18/6/1948.

Burt (1917, l.c., pg. 239) indicates that there are many species connecting *Coniophorella* with *Coniophora*, and that the presence or absence of cystidia is not a good character for segregating these genera. For this reason his rejection of the genus *Coniophorella* is followed here, though the cystidia of *C. olivacea* are an extremely distinctive aid to specific diagnosis. In this species the cystidia are modified lateral branches of ordinary hyphae, and in form and origin resemble those of *Peniophora aspera* q.v.

The South African collections cited above appear to be darker than British ones, and their spores average slightly larger and slightly darker, especially in the epispore, than in the British specimens. The writer does not consider that the differences are sufficiently marked to warrant a new name, especially as he has not been able to compare with the type of C. atrocinerea, which Rogers and Jackson reduce to synonymy with C. olivacea. The spores in South African specimens are mummy-brown colour, $6 \times 12 \mu$; those of British specimens are Saccardo's umber, $5 \times 11.4 \mu$.

NOTE ON SYNONYMY:

Burt (1917 l.c.) notes that an authentic specimen of *Thelephora olivacea* Fries [Fries, Elenchus Fung. 1 (1828) 197; Epicr. Syst. Myc. (1836–38) 543; Berkeley, Outl. Brit. Fung. (1860) 269] in Herb. Kew is *Coniophora Betulae*, and not the present species.

Bourdot and Galzin [in Hym. de Fr. (1928) 360] note: "C. fumosa Karst., after an authentic specimen, is, according to Höhnel and Litschauer (Beitr. 1906, p. 26), a form of C. arida with much smaller spores, $9-10 \times 6-7 \mu$. The original of the same C. fumosa does not differ from C. olivacea, according to the same authors (Beitr. 1908, p. 16)."

NOTE ON OTHER CONIOPHORA SPECIES RECORDED FOR SOUTH AFRICA.

- (1) C. puteana (Schum. ex Fr.) Karst. [= C. cerebella (Pers.) Duby]. Mrs. R. Brown (R. Lurie) records in S.A. Journ. Sci. 33 (1936) 388 that several collections of this species have been made in the gold mines of the Central and East Witwatersrand, at temperatures between 68°-72° F. These collections have not all been seen by the writer, but he feels that they may prove to be C. fodinarum, which comes from mines and has frequently been mistaken for C. puteana.
- (2) In Herb. Pretoriae No. 30633 is a *Coniophora* collected from the wall of a dairy by K. Morgan, Hopevale, Donnybrook, Natal, 6/5/1939. This fungus is characterised by a very heavy encrustation of minerals on the hyphae which is suggestive of *Coniophora Betulae* (Schum.) Karst, but as good material of that species is lacking Kew I am unable to make a satisfactory comparison. Superficial comparison suggests that the hymenium

of No. 30633 is much too dark (dark red-brown) and that the trama is too thick and membranous. There is also some doubt whether *C. Betulae* is not merely a variation from *C. suffocata* (Peck) Massee. [See Rogers and Jackson in Farlowia 1 (1943) 280.]

(3) Miss D. Weintroub has submitted to us several specimens of *Coniophora* collected from mires, which at present cannot be named.

STEREUM Persoon ex S. F. Gray.

Key to species described:-

- 1. Fresh plant exuding reddish juice when wounded: conducting organs seen microscopically:
 - a) Thin; reflexed surface clothed with short silky hairs; spores (7)-8-(9) \times 3-3·5 μ ; on conifers *S. sanguinolentum* (1).
 - aa) Thick; conspicuously rimose; reflexed surface clothed with a thick pad-like tomentum; spores $3 \cdot 5 5 \cdot 5 \times 2 3 \mu$; on indigenous woods

 S. rimosum var. africanum (2).
- 2. Fresh plant not "bleeding"; conducting organs absent.
 - a) Gloeocystidia abundant, hyaline; hymenium pallid; abhymenial surface snuff-brown; spores $3-4\cdot5\times2-3~\mu$ S. bicolor (3).
 - aa) Gloeocystidia absent:
 - x. Large encrusted (rarely smooth) peniophoroid cystidia present:
 - y. Cystidia hyaline, or faintly yellowish, not arising from skeletal hyphae; spores 10-13 \times 6-7 μ S. cinerascens (4).
 - yy. Cystidia dark coloured (sometimes nearly smooth), arising as apical modifications of skeletal hyphae; spores 6-8 \times 3-4 μ S. umbrinum (5).
 - xx. Peniophoroid cystidia absent:

Cylindrical, rugose, coloured "false setae" arising from skeletal hyphae present, darkening in potash; spores $6-7 \times 3-4 \mu$ S. Schomburgkii (6).

- Stereum sanguinolentum (A. and S.) Fries, Epicrisis (1838) 549, Hym. Eur. (1874) 540; Albertini and Schweinitz, Consp. Fung. (1805) 274 (under β. Sterea of Thelephora); Schweinitz in Naturforsch. Ges. Leipzig Schrift 1 (1822) 106; Berkeley, Outl. Brit. Fung. (1860) 271; Saccardo, Syll. Fung. 6 (1888) 564; Quélet, Fl. Myc. de Fr. (1888) 14; Karsten, Myc. Fenn. 3 (1876) 306, Finnlands Basidsv. (1887) 396; Cooke, Brit. Fung. Handbook 1 (1871) 317; Massee in Journ. Linn. Soc. Bot. 27 (1890) 189; Greville, Scot. Crypt. Flora 4 (1826) t. 225; Bresadola in Ann. Myc.1 (1903) 92; Höhnel and Litschauer, Weisner Festschr. (1908) 60; Herter, Pilze in Krypt.—Fl. der Mark Brand. 6 (1910) 125; Brinkmann, 44 Jahresber. Westf. Prov. Ver. f. Wiss. (1916) 34; Burt in Ann. Mo. Bot. Gard. 7 (1920) 145; Bourdot and Galzin in Bull. Soc. Myc. de Fr. 37 (1921) 109, Hym. de Fr. (1928) 373; Pilát in Hedwigia 70 (1931) 59; Velenovský, České houby (1922) 761; Rea, Brit. Basid. (1922) 663.
 - Thelephora sanguinolenta Alb. and Schwein., Consp. Fung. (1805) 274; Fries, Syst. Myc. 1 (1821) 440; Elenchus Fung. 1 (1828) 178; Greville, Scott. Crypt. Fl. 4 (1826) t. 225.

Thelephora hirsuta β Persoon, Synopsis (1801) 570, (fide Pilát).

Thelephora sericea β Persoon, Myc. Eur. 1 (1822) 117, (fide Pilát).

- Stereum crispum Quélet, Assoc. Franc. 18 Suppl. (1891) 2; Schroeter, Pilze Schl. in Kohns Krypt.—Fl. v. Schl. 3 (1889) 427; Herter in Krypt.—Fl. der Mark Brand. 6 (1910) 124, (fide Pilát).
- Stereum balsameum Peck in N.Y. State Mus. Rept. 27 (1875) 99, ibid. 30 (1879) 75; Saccardo, Syll. Fung. 6 (1888) 584; Massee in Journ. Linn. Soc. Bot. 27 (1890) 196, (fide Pilát).
- Stereum balsameum f. reflexum Peck, N.Y. State Mus. Rept. 47 (1894) 152, (fide Pilát).

Stereum rigens Karsten in Finska Vet. Soc. Bidrag Natur och Folk 37 (1882) 243, ibid. 48, p. 396; Saccardo, Syll. Fung. 11 (1895) 121; Pilát in Bull. Soc. Myc. de Fr. 42 (1926) 109, Hedwigia 70 (1931) 62 (as f. rigens Karst. pro sp.); fide Burt. Illustrations: Greville (1826) l.c., Pl. 225; Burt in Ann. Mo. Bot. Gard. 7 (1920) 145, f. 20.

PLATE 25.

Flesh exuding reddish juice when wounded in fresh state. Coriaceous, thin, resupinate, effused, becoming narrowly reflexed, orbicular-confluent; margin acute, pallid. Hymenium wood-brown becoming darker, smooth or cracking rimosely, often zonate. Surface villose with short, adpressed, silky hairs, zonate and striate, some tint of buff. In section 400-500 μ thick, excluding surface hairs.

Basidia: Clavate, 25-40 \times 4.5-6.5 μ .

Spores: hyaline, smooth, cylindric, unilaterally depressed, (7) 8 (9) \times 3 -3 · 5 μ .

Conducting organs: conspicuous, reddish-brown, numerous, in the intermediate tissues and curving upwards to the hymenium, 3.4 μ wide, very occasionally forked. Surface hairs: simple, thick-walled, agglutinated, short, adpressed, 4-5 μ wide.

Specimens examined: 28933, *Doidge* and *Morgan*, on dead coniferous wood, Donnybrook Forest, Natal, Feb. 1935.

This specimen is more reflexed than is usual in British material, but the writer feels no doubt as to its identity. Stereum rimosum var. africanum, the common "bleeding" Stereum of South Africa, is much more reflexed, thicker, has yellow conducting vessels, and spores about half the size of those in S. sanguinolentum. The thin, almost papery texture of the latter is at once a characteristic difference. S. sanguinolentum is usually a North Temperate species, and was possibly introduced to South Africa with conifers imported for plantations.

2. Stereum rimosum Berk, var. africanum Talbot apud Wakefield and Talbot in Bothalia 4 (1948) 945, fig. 5.

Stereum adnatum Lloyd in Myc. Writ. 7 (1925) 1336, f. 3093.

Effused, resupinate-reflexed, sometimes sessile, attached by a broad umbo, or composed of several connate, resupinate-umbonate pilei, each roughly circular in outline, coriaceous. Surface cinnamon-buff colour, concentrically furrowed, covered with a thick, felty, pad-like tomentum. Margin even or lobate. Hymenium rimose, showing pallid, silky context, often concentrically zoned, warm buff or pinkish buff, when older becoming a darker vinaceous or cinereous colour. Almost certainly a "bleeder" when fresh.

Basidia: closely aggregated, $4-4.5 \mu$ wide at apex.

Spores: hyaline, smooth, elliptic-ovate, with one side frequently depressed, and a small

attenuated apiculus, $2-3 \times 3.5-5.5 \mu$.

Conducting organs: yellow, $5.5~8.5~\mu$ wide, with rigid walls, in a layer about 200 μ wide, distributed in the subhymenium and curving upwards into the hymenium, not emergent.

Hyphae: thin-walled, hyaline, frequently septate, 3·5 μ wide. Trama bordered next to the tomentum by a narrow orange coloured zone. Width in section, excluding

tomentum, $700-1,000 \mu$.

Surface hairs: thick-walled, very much intertwined, almost hyaline to pale yellowish,

 4.2μ in width.

Specimens examined: Type, 30233, Rump (486), Karkloof, Natal; 30268, Morgan and Doidge, Donnybrook, Natal, 1936; 30777, Bower, Entabene, Louis Trichardt, Tvl. 24/8/38 (bleached and insect-eaten); 28285, Rump (205), Town Bush, Maritzburg, Oct. 1934; Uganda; T. D. Maitland (460) 1919 and (19. A) 1915; The following under Stereum adnatum in Herb. Kew: 27755, Rump (98), Hilton Road, Natal, Aug. 1934; 28296, Rump (222) Town Bush, Maritzburg, Oct. 1934; 28303, Rump (232), Town Bush, Maritzburg, Oct. 1934.

Massee [in Journ. Linn. Soc. Bot. 27 (1890) 187] quotes the spores of the species $S.\ rimosum$ as "globose, 6.7 μ diam." I have examined the type specimen in Herb. Berkeley (Darjeeling, 7,500 ft.) at Kew, and was unable to confirm the presence of such basidiospores although there were large numbers of globose hyphomycete spores, 4-6.5 μ diam., echinate and faintly coloured, which were conclusively traced to conidiophores of an Aspergillus sp. Should basidiospores of the sort described by Massee be found in the species $S.\ rimosum$, it will be necessary to alter the variety africanum to specific rank. Apart from the above consideration of spores, the species and the new variety are identical in microscopic structure but differ macroscopically. Whereas the species is usually more or less pileate or sessile-umbonate, the variety is more resupinate-reflexed and has a tomentum of much greater thickness. The variety has a more markedly zoned, lighter coloured hymenium than the almost livid hymenium of the species.

Lloyd (loc. cit.) described *Stereum adnatum* from South Africa, but stated that it lacks distinctive cystidia, ducts and vesicular cells. The writer has recently seen a co-type of Lloyd's species (No. 1708, *Doidge*, on dead branch, Zoutpansberg, Tvl., 4/8/1911) which possesses ducts and is identical with *S. rimosum* var. *africanum*. It is considered that the fungus only merits varietal rank, and consequently *S. adnatum* is reduced to synonymy. C. H. Humphrey (in Litt., Division of Botany File No. M. 31/86/1) considers that *S. rimosum* and *S. adnatum* are identical.

Stereum bicolor (Pers. ex Fries) Fries, Epicrisis (1838) 549, Hym. Eur. (1874) 640;
 Saccardo, Syll. Fung. 6 (1888) 565; Massee in Journ. Linn. Soc. Bot. 27 (1890) 177; Rea, Brit. Basid. (1922) 665; Kalchbrenner in Grev. 10 (1881) 58; van der Byl in Trans. Roy. Soc. S.A. 10 (1922) 153; Wakefield in Det. Kong. Norske Vidensk. Selsk. Forh. 9 (1936) 52.

Thelephora bicolor Persoon, Syn. Meth. Fung. (1801) 568, Myc. Eur. 1 (1822)-122; Fries, Syst. Myc. 1 (1821) 438.

Lloydella bicolor (Pers. ex Fr.) Bresadola in Lloyd Myc. Writ. 1 (1898) 51.

Stereum fuscum (Schrader) Quélet, Flor. Myc. de Fr. (1888) 14; Karsten, Finn. Basidsv. (1889) 397; Bresadola, Fung. Kmet. (1897) 106; Burt. in Ann. Mo. Bot. Gard. 7 (1920) 117, Pl. 4, f. 26; Bourdot and Galzin, Hym. de Fr. (1928) 382; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 41; Pilát in Hedwigia 70 (1930) 92.

Thelephora fusca Schrader, Spic. Fl. Germ. (1794) 184; Persoon, Syn. Meth. Fung. (1801) 568, Myc. Eur. 1 (1822) 122; Fries, Syst. Myc. 1 (1821) 438.

Stereum coffeatum Berk. and Curt. ! in Grevillea 1 (1873) 164; Saccardo, Syll. Fung. 6 (1888) 568; Massee in Journ. Linn. Soc. Bot. 27 (1890) 190.

Thelephora vinosa Persoon, Syn. Meth. Fung. (1801) 578, (fide Pilát).

Stereum pannosum Cooke! in Grevillea 8 (1879) 56; Massee in Journ. Linn. Soc. Bot. 27 (1890) 185 (non *Thelephora pannosa* Sow. ex Fr.).

Illustrations: Burt (1920) l.c., Pl. 4, f. 26; Fries, Icones Hym. Pl. 197, f. 2; Karsten, Icones Hym. Pl. 2, f. 9.

PLATE 26.

Occasionally entirely resupinate, usually resupinate-reflexed, sometimes pileate, imbricate, soft spongy texture. Abhymenial surface snuff-brown, concentrically furrowed, floccose, becoming smooth. Margin paler. Hymenium smooth, whitish to creamy, not furrowed, sometimes rimose when dry, rather velvety. In section up to 1,000 μ thick; hymenial layer hyaline, about 100 μ thick, the rest of the tissue coloured brownish. Not adnate.

Basidia: $3.5-5.5 \times 22-27 \mu$, cylindric, with 2 or 4 sterigmata.

Spores: hyaline, smooth, elliptical, unilaterally depressed, or oblong, frequently guttulate, $3-4\cdot 5\times 2-3~\mu$.

Gloeocystidia: very abundant in the hymenium, not usually emergent, hyaline, very refractile, thin walled, cylindric, fusoid or somewhat ventricose, averaging 4-11 \times 90 μ , borne on very narrow hyaline hyphae about 2 μ wide, frequently fragmented when old.

Hyphae: all smooth, thin-walled, with occasional to numerous clamp connections, much branched, septate; subhymenial hyphae colourless to pale brownish, $1 \cdot 5-3 \mu$ wide; tramal hyphae brown, $3-6 \mu$ wide, loosely intertexed.

Specimens examined: v. d. Byl (2239), South Africa, sine loc.; 27596, Rump (12), Maritzburg, 1934; Read (T.R.L. 200), Rooikoppies, Duiwelskloof, N.Tvl., Apr. 1937; MacOwan (1244), C.B.S. 9/83, in Herb. Kew; Thorold (77), Njoro, Kenya, 1923; Farquharson (48), Eket Distr., S. Nigeria; Maitland (451), Uganda, March 1919; Maitland, Victoria Nyanza, Uganda, 14/7/1914.

NOTE ON NOMENCLATURE:

In the works of Persoon and Fries prior to the "Epicrisis" (1838), the species was placed in the tribe *Stereum* of the genus *Thelephora*, and *T. fuscum* Schrad. was quoted as a synonym, indicating that the authors recognised it as the same plant but had renamed it, no doubt because the epithet *bicolor* is so much more descriptive of the species. Art. 40 of the International Rules of Botanical Nomenclature states: "The name of a taxonomic group is not validly published when it is merely cited as a synonym." Further, as nomenclature of this group starts with Fries' (1821-32) "Systema", the name of the species in question must be taken as *S. bicolor* (Pers. ex Fr.) Fr., and not as *S. fuscum* (Schrad.) Quél. as is most frequently done.

Stereum pannosum Cooke! appears to be the same as S. bicolor in all respects. Bresadola [in Ann. Myc. 14 (1916) 232] gives the former as a synonym of Lloydella Beyrichii (Fr.) Bres., which was published as Thelephora Beyrichii by Fries in Linnea 5 (1830) 529. Bresadola'a definition of the genus Lloydella [in Lloyd, Myc. Writ. 1 (1899) 51] was, "Stereum possessing cystidia," but he included in it species such as S. cinerascens (with large encrusted cystidia), S. bicolor (with gloeocystidia) and later S. Schomburgkii (with "false setae"), and it is thus a highly artificial genus not worthy of retention.

4. Stereum cinerascens (Schw.) Massee! in Journ. Linn. Soc. Bot. 27 (1890) 179; Burt in Ann. Mo. Bot. Gard. 7 (1920) 203; Bourdot and Galzin, Bull. Soc. Myc. de Fr. 37 (1920) 203, Hym. de Fr. (1928) 376; Pilát in Hedwigia 70 (1931) 83; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 43.

Thelephora cinerascens Schweinitz in Amer. Phil. Soc. Trans. N.S. 4 (1832) 167. Hymenochaete cinerascens (Schw.) Lèveillè in Ann. Sci. Nat. Bot. ser. 3: 5 (1846) 152.

Peniophora cinerascens (Schw.) Saccardo, Syll. Fung. 6 (1888) 646.

Lloydella cinerascens (Schw.) Bresadola in Lloyd Myc. Writ. 1 (1901) 51.

Peniophora Schweinitzii Massee in Journ. Linn. Soc. Bot. 25 (1889) 145.

Corticium aschistum Berk. and Curt. ! in Amer. Acad. Arts and Sci. Proc. 4 (1858) 123; Berkeley in Grevillea 2 (1873) 3.

Peniophora Berkeleyi Cooke! in Grevillea 8 (1879) 20; Saccardo, Syll. Fung. 6 (1888) 642; Massee in Journ. Linn. Soc. Bot. 25 (1889) 144.

Stereum moricola Berk. ! in Grevillea 1 (1873) 162; Saccardo, Syll. Fung. 6 (1888) 567.

Peniophora moricola (Berk.) Massee in Journ. Linn. Soc. Bot. 25 (1889) 141.

Stereum dissitum Berk. ! in Grevillea 1 (1873) 64.

Peniophora dissita (Berk.) Cooke in Grevillea 8 (1880) 150; Saccardo, Syll. Fung. 6 (1888) 645; Massee in Journ. Linn. Soc. Bot. 25 (1889) 143.

Corticium ephebium Berk. and Curt. ! in Grevillea 1 (1873) 178; Saccardo, Syll. Fung. 6 (1888) 618.

Peniophora ephebia (B. and C.) Massee in Journ. Linn. Soc. Bot. 25 (1889) 131.

Stereum neglectum Peck, N.Y. State Mus. Rept. 33 (1880) 22.

Peniophora neglecta (Peck) Peck, N.Y. State Mus. Rep. 40 (1887) 76.

Peniophora occidentalis Ellis and Everh. ! in Bull. Torrey Bot. Club 24 (1897) 277; Saccardo, Syll. Fung. 14 (1900) 224.

Lloydella occidentalis (Ellis and Everh.) Höhnel and Litschauer in K. Akad. Wiss. Wien. Sitzungsb. 116 (1907) 791.

Stereum purpurascens Lloyd, Myc. Writ. 4 (1914) L. 53: 15.

Hymenochaete bonariensis Speg. (fide Bresadola, Sel. Myc. ii. Trento. 1916).

Above Synonymy after Pilát, loc. cit.

Illustrations: Cooke in Grev. 8 (1879) Pl. 122, f. 4; Burt in Ann. Mo. Bot. Gard. 7 (1920) f. 36 and Pl. 6, f. 64.

PLATE 27.

Coriaceous, resupinate, not adnate, effused, sometimes with a narrowly reflexed margin. Abhymenial surface ochraceous, ashen or warm buff, with sharp hairs, concentrically furrowed. Hymenium drab or pinkish buff, smooth, sometimes slightly scabrid to touch. In section 250–400 800 μ thick. Cystidia plainly visible with a hand lens.

Basidia: $40-50-(60) \times 9-10 \,\mu$, clavate.

Spores: hyaline, smooth, oblong-cylindric, often with one side depressed, $6-7 \times 10-13\mu$. Cystidia: embedded or occasionally projecting, heavily encrusted with large crystals, thick-walled, often faintly coloured at the base, conical, $100-(150) \times 12-24 \mu$.

Hyphae: $3.5-4-4.5 \mu$ wide, hyaline to very faintly coloured, rather opaque and stoutwalled, those adjacent to the substratum forming a narrow, dense, yellow-brown layer.

Abhymenial hairs: much intertwined, like the hyphae but dark coloured.

Specimens examined: v. d. Byl (2732), Table Mountain, Natal, June 1930; 28688, Rump (280), Town Bush, Maritzburg, Nov. 1934; 28498, Rump (255), Town Bush, Maritzburg, Oct. 1934; 34377, Rump, Town Bush, Maritzburg, 1936; 35421, Rump (700), Isipingo Beach, Natal, 1944; 31368, Duthie, Knysna; 28926, no details of collection; Maitland (114), Uganda (as Peniophora occidentalis in Herb. Kew.).

The marked affinity of *S. cinerascens* to *Lopharia mirabilis*! is discussed elsewhere (page 57). On casual examination *S. cinerascens* might be taken for a *Peniophora*, but it is distinguished even when wholly resupinate by a *Stereum* distribution of tissues, and by its loose attachment to the substratum by distinct hairs.

Peniophora flavido-alba Cooke!, an American species, is very near to S. cinerascens but its spores are only $4.5-6 \times 2.5-3.5 \mu$, and also it cracks a lot on drying. The small spores of this species come within the range of Peniophora Roumeguerii which is somewhat allied in structure, but is nevertheless quite distinct.

5. Stereum umbrinum Berk, and Curtis! in Grevillea 1 (1873) 164; Wakefield in Kew Bull. (1915) 369; Burt in Ann. Mo. Bot. Gard. 7 (1920) 191; Pilát in Hedwigia 70 (1930) 94; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 42; Bourdot and Galzin in Bull. Soc. Myc. de Fr. 37 (1921) 123, Hym. de Fr. (1928) 382.

Thelephora crassa Léveillé in Gaudichand, Voyage Bonite Bot. 1 (1846) 190, Pl. 139, f. 1 [non Stereum crassum Fries, R. Soc. Sci. Upsal. Actis. 3 (1851) 111].

Hymenochaete crassa (Lév.) Berk. apud Cooke in Grevillea 8 (1880) 148; Saccardo, Syll. Fung. 6 (1888) 597; Massee in Journ. Linn. Soc. Bot. 27 (1890) 114.

Hymenochaete umbrina B. and C. apud Cooke in Grev. 8 (1880) 148; Saccardo, Syll. Fung. 6 (1888) 598; Massee in Journ. Linn. Soc. Bot. 27 (1890) 113.

Hymenochaete vinosa (Berk.) Cooke! in Grev. 8 (1880) 149; Saccardo, Syll. Fung. 6 (1888) 600.

Hymenochaete multispinulosa Peck in Bot. Gaz. 7 (1882) 54; Saccardo, Syll. Fung. 6 (1888) 600; Massee in Journ. Linn. Soc. Bot. 27 (1890) 108.

Hymenochaete scabriseta Cooke! in Ravenel, Fung. Amer. (1882) 717; Massee in Journ. Linn. Soc. Bot. 27 (1890) 113, Pl. 5, f. 7.

Lloydella scabriseta (Cooke) Höhnel and Litschauer in K. Akad. Wiss. Wien. Sitzungzb. 115 (1906) 1580.

Hymenochaete purpurea Cooke and Morgan! apud Cooke in Grev. 11 (1883) 106; Morgan in Cicinnati Soc. Nat. Hist. Journ. 10 (1888) 198; Saccardo, Syll. Fung. 6 (1888) 597; Massee in Journ. Linn. Soc. Bot. 27 (1890) 115.

Kneiffia purpurea (Cooke and Morgan) Bresadola in Ann. Myc. 1 (1903) 100.

Peniophora intermedia Massee in Journ. Linn. Soc. Bot. 25 (1889) 143; Saccardo, Syll. Fung. 9 (1891) 238.

Hymenochaete Kalchbrenneri Massee! in Journ. Linn. Soc. Bot. 27 (1890) 116; Saccardo, Syll. Fung. 9 (1891) 230.

Above synonymy after Pilát.

Illustrations: Burt (1920) l.c., f. 31; Massee in Journ. Linn. Soc. Bot. 27 (1890) Pl. 5, f. 7.

PLATE 28.

Resupinate, effused, sometimes narrowly reflexed, never pileate; margin shortly villose. Context soft, spongy. Hymenium velutinous, cracking but little in drying, sometimes pitted, umber, vinaceous purple, purple-brown, light sandy-brown, or snuff-brown in colour.

Basidia: hyaline or very faintly coloured, about $6 \times 30 \mu$.

Spores: cylindrical to ellipsoid, hyaline, smooth, $3-4 \times 6-8 \mu$.

Cystidia: originating in basal or middle part of the trama, curving upwards into hymenium and frequently projecting 10-20 μ beyond; dark yellow-brown, in young stages lighter colour, not very thick-walled, encrusted or rugose especially near the apex, rarely quite smooth, $100-250 \times 7.9~\mu$, cylindric-clavate or fusoid, arising as apical modifications of skeletal hyphae.

Hyphae: lightly coloured, 3-4.5 μ wide, in a loose network, lacking clamp connections, not forming a distinct intermediate layer of tissue.

Specimens examined: Type in Herb. Berk. at Kew; 22044, P. MacOwan (1054), Boschberg, Somerset East, 1876 (as Peniophora cinerea in Herb. Pretoriae); van der Byl (2737), Izotsha, Natal, Feb. 1930; 30220, Rump (433) Umgeni Bush, Durban; 27626, Rump, Cato Ridge, Natal, 1934; 34357, Rump, Table Mountain, Natal, 1935; 34393, Rump (613), Table Mountain, Natal, July 1935; 35419, Rump (679), on Quercus, Maritzburg, 1943; 34381, Rump, Town Bush, Maritzburg, May 1936; 33392, 33400, Scott, on Populus, Pretoria, March 1942; 36839, Talbot, Garstfontein, Pretoria, 21/8/48; 36710, Talbot, Kloof Falls, Natal, 31/5/48; the following from Town Bush, Maritzburg, Aug.-Nov., 1934 viz. 28294, Rump (218); 28702, Rump (305); 28276, Rump (208); 28277, Rump (209); 27767, Rump (122).

The cystidia of this species are apical modifications of skeletal hyphae, reminiscent of the origin of the "false setae" in the genus *Duportella*. They do not darken in potassium hydrate and are paler and differ in origin and morphology from the true setae of an *Hymenochaete*, but in some specimens they lack conspicuous encrustation or roughness. This is one of the few species of *Stereum* lacking a distinct layer of horizontal hyphae as an intermediate or basal tissue. Its closest affinity is with *Stereum papyrinum* Mont. ! (= S. membranaceum Fr.) which may be distinguished by frequently being pileate and always possessing wider, more encrusted, more peniophoroid cystidia with thicker walls.

Most Natal specimens of S. umbrinum have a purplish tinge in place of the umber colour, and their tissues are rather more loosely interwoven than in typical North American specimens. But the fungus does vary greatly in texture and colour, as is beautifully demonstrated in a set of E. A. Burt's specimens in Herb. Kew., illustrating the synonymy of the species.

No. 34393 has hyaline cystidia, but is otherwise indistinguishable from the purple

forms of this species.

 Stereum Schomburgkii Berkeley! in Journ. Linn. Soc. Bot. 13 (1873) 168; Saccardo, Syll. Fung. 6 (1888) 568; Wakefield in Kew Bull. (1914) 259; Lloyd, Myc. Writ. 6 (1919) 960; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 43; Bannerjee in Journ. Ind. Bot. Soc. 14 (1935) 33.

Lloydella Schomburgkii (Berk.) Bres. var. brunnea Bresadola in Ann. Myc. 18 (1920) 45; Saccardo, Syll. Fung. 23 (1925) 534.

Stereum atrocinereum (Massee) v. d. Byl in Ann. Univ. Stellenbosch 7 (1929) 44. Peniophora atrocinerea Massee! in Journ. Linn. Soc. Bot. 25 (1889) 141.

Stereum retirugum Cooke! in Proc. Roy. Soc. Edinb. (1882) 456; Massee in Journ. Linn. Soc. Bot. 27 (1890) 186; Saccardo, Syll. Fung. 23 (1925) 510; Bresadola in Ann. Myc. 14 (1916) 232.

Hymenochaete olivaceum Cooke! in Grevillea 14 (1885) 11; Massee in Journ. Linn. Soc. Bot. 27 (1890) 116.

Hymenochaete griseocervina P. Henn., fide Bresadola in Ann. Myc. 18 (1920) 70. Illustrations: PLATE 29, mature stage; PLATE 30, young stage.

Resupinate or resupinate-reflexed, or conchiform attached by a small umbo, orbicular-confluent, thin, coriaceous, or papyraceous, loosely attached to the substratum. Reflexed surface tomentose, glabrescent when old, buffy-brown, concentrically furrowed in pileate specimens, the troughs being paler. Hymenium smooth, or more usually furrowed concentrically and cracking radially. Colour very variable through umber, brown, olive brown, light yellow brown, brownish slate, depending on the state of development. Margin narrow, yellowish, finely fibrillose, usually free. Context concolorous, 200 (500) μ thick.

Basidia: clavate, 4 5.5×20 25 μ , in young stages in a regular palisade, later interrupted and exceeded by the false setae.

Spores: not seen (" $6-7 \times 3-4 \mu$, colourless "—v. d. Byl).

False setae: $3.5\,8\,\mu$ wide, cylindrical, often with a fusoid apex, thick-walled with a very narrow lumen sometimes expanded at the apex, immersed or emergent up to $16\,\mu$, originating as horizontal skeletal hyphae which curve upwards into the hymenium, therefore the total length is variable and indeterminable, very densely arranged, darkening in 5 per cent. KOH.

Hyphae: (1) Skeletal hyphae, brown, thick-walled, smooth, without clamps, of the same dimensions as the false setae. (2) Colourless hyphae intermeshing the skeletal, 3·5 4·5 μ wide, often indistinct, thin to thicker-walled, with occasional clamp connections. Hyphae forming a more or less horizontal weft without a darker or more compact basal layer.

Surface hairs: pallid to light yellow-brown, 5 μ diam., fairly thick-walled, septate, with occasional clamp connections.

Specimens examined: Type, Schomburg, Port Darwin, Australia; Cheesman, New S. Wales, Australia, 1914; Crawford, New England, Australia; 27644, Rump (33), Cato Ridge, Natal, 1934; 27544, Rump, Winterskloof, Natal, 1934; 27552, Rump (20), Table Mountain, Natal, 1934; 35327, Rump (683), on Quercus, Maritzburg, 1943; 28942, Doidge, Xumeni Forest, Donnybrook, Natal, June 1935; 20944, MacOwan (1210?), in Herb. Pretoriae as Corticium albocinereum Kalch., possibly a pen error of MacOwan for C. atrocinereum: Rump (273) Town Bush, Maritzburg, Oct. 1934; 34951, Simpson and Talbot, Qudeni, Zululand, 1945; O. A. Höeg (F. 67), Eshowe, Zululand, Aug. 1929; Maitland (542), Mombasa, Kenya, Sept. 1920; Dümmer (1133), Kipayo, Uganda, Oct. 1914; Dümmer (945), Kipayo, Uganda, Aug. 1914; Maitland (34 a.), Uganda, Jan. 1915; Farquharson (3), S. Nigeria, 1914; van der Byl (1049), East Africa, 1923; MacOwan, Cape Province (in Herb. Kew under Corticium atrocinereum Kalchbr.); Pegler (1234), Kentani, C.P., (in Herb. Kew under Stereum membranaceum Fr.); the following specimens from Town Bush, Maritzburg, Oct. 1934, viz. 28496, Rump (252); 28499, Rump (258); 28304, Rump (235); 28504, Rump (274); 28687, Rump (278).

Stereum atrocinereum (Massee) v. d. Byl is reduced to synonymy for the following reasons: On the only sheet of "Corticium atrocinereum Kalchbr." in Herb. Kew there is a note from the collector, P. MacOwan, which reads "I take this to be Corticium atrocinereum Klch. described from the single set of sps. sent in '66. I have not yet received from the author an authentic type, but the description agrees. Authentication hereafter. P. MO." As far as can be ascertained this specimen was never authenticated and the name Corticium atrocinereum Kalchbr. is a nomen nudum and must be disregarded. This specimen is, however, the type of Peniophora atrocinerea Massee. Van der Byl (l.c.) bases his description on a collection by MacOwan, Crypt. Aust. Africa 1197, Boschberg, Somerset East, in Herb. S.A. Musuem No. 34248, which he assumes is part of the same collection as reached Kew under the name C. atrocinereum. Massee gives the spore size as $10 \times 4-5 \mu$; van der Byl as $8 \times 4 \mu$; the present writer has only found spores in No. 35327, where they measured (5)–6–(7) \times (3)-4 μ .

The MacOwan specimens differ from the other specimens of S. Schomburgkii only in the colour of the hymenium, but this slight difference is found to be embraced in variations in colour which form a natural graded series over a large number of collections. The reason for this variation in colour is discovered microscopically, and is of considerable interest. The depth of colour is dependent on the number of skeletal hyphae which curve upwards and emerge as false setae. Thus in the pale stage (Plate 30) (S. atrocinereum) there is an almost continuous palisade of basidia at the surface, and only a few of the horizontal dark hyphae curve up through the hymenium. There is also a larger proportion of hyaline generative hyphae than is found in dark forms. This too is the case in the pale margin of an otherwise characteristically dark-coloured S. Schomburgkii and it suggests that the pale form is simply a young stage in the development of the plant. In dark specimens the basidia are separated to a considerable extent by the intrusive false setae, and do not form a continuous palisade. The greatest number of emergent false setae is always found towards the centre away from the growing margin. The pale condition is undoubtedly associated with young stages of growth (e.g. at the margin), but it seems likely that it is also associated with rapidity of centrifugal growth, for some pale specimens are luxuriantly developed and occupy a large area. It would seem that the false setae are differentiated some time after the formation of the hymenium and that they remain smooth and more or less horizontal beneath the hymenium until a certain age or slackening in the growth rate, then there is some stimulus which causes them to curve upwards and become minutely rugose false setae. Petch [in Ann. Roy. Bot. Gard. Perad. 9 (1925) 259] observes that in many species of *Stereum* the fungus may attain full stature before the hymenium is formed, and in such herbarium specimens there is likely to be a lack of accessory hymenial organs, e.g., cystidia. Present work shows that in *Stereum Schomburgkii* the reverse appears to be true, namely, that the basidia are precocious. This is of particular interest in view of the very late development of basidia above the false setae in *Duportella tristicula* (B. & Br.) Reinking, a species which the auther considers related to *S. Schomburgkii* in the same way as the genera *Gloeocystidium* and *Peniophora* are to *Corticium*. (See notes on *D. tristicula*, page 46.)

The only record of *Stereum membranaceum* Fr. in South Africa [Pole Evans and Bottomley in Ann. Bolus Herb. 2 (1918) 192] is based on a specimen from Kentani, Pegler (1234). This is not *S. membranaceum* but appears to be a pale form of *S. Schomburgkii* in which the false setae are more encrusted apically than is usual in this species.

SYNONYMS AND EXCLUDED SPECIES IN STEREUM.

adnatum Lloyd=Stereum rimosum Berk. var. africanum Talbot q.v.

atrocinereum (Massee) v. d. Byl !=Stereum Schomburgkii Berk. q.v.

duriusculum B. and Br. !=Asterostromella duriuscula (B. and Br.) comb. nov. q.v.

fuscum Schrad. ex Quélet=Stereum bicolor Pers. ex Fr. q.v.

luteobadium Fries = Hymenochaete luteobadia (Fr.) Höhnel and Litsch.

rubiginosum=Hymenochaete rubiginosa q.v.

INCORRECT RECORDS OF STEREUM SPP. IN SOUTH AFRICA.

albobadium (Schw. ex Fr.) Fr. Recorded in Grevillea 10 (1881) 58. The specimen referred to lacks cystidia and branched paraphyses and cannot be *S. albobadium*. The material is so scanty that it probably cannot be named with certainty.

elegans Meyer. Recorded in Fungi MacOwani, Grev. 10 (1881) 58. The specimen referred to is *Stereum Thozetii* Berk.

luteobadium Fries. Recorded in Grev. 10 (1881) 58. The specimen referred to is *Stereum fasciatum* Schw.

membranaceum Fries. Recorded in Ann. Bolus Herb. 2 (1918) 192. The specimen referred to is a pale form of *Stereum Schomburgkii* Berk.

rimosum Berk.! Specimens ex Herb. Pretoriae Nos. 28285 and 30777 in Herb. Kew, should be transferred to *S. rimosum* var. *africanum* nov. var.

percome B. and Br. ! The MacOwan specimen in Herb. Kew. No. 7355 is *Hymenochaete nigricans* (Lév.) Bres.

pruinatum B. and C.! The MacOwan collection (1227), Somerset East, in Herb. Kew. No. 7396 has been compared with the type of *S. pruinatum* and is not that species.

RESUPINATE SPECIES OF STEREUM RECORDED FOR SOUTH AFRICA BUT NOT AVAILABLE FOR STUDY.

laxum Lloyd. Lloyd, Myc. Writ. 4 (1915) L. 60, p. 10.

DUPORTELLA Patouillard.

1. Duportella tristicula (B. & Br.) Reinking in Philippine Journ. Sci. 17 (1920) 364, [in error as Duportella tristiuscula (Berk.) Pat.].

Corticium tristiculum B. & Br. ! in Journ. Linn. Soc. Bot. 14 (1873) 71; Saccardo, Syll. Fung. 6 (1888) 622; Petch in Ann. Roy. Bot. Gard. Perad. 9 (1925) 282.

Hymenochaete tristiuscula (B. & Br.) Massee in Journ. Linn. Soc. Bot. 27 (1890) 111 (orthographic variant); Teodoro, Enum. Philippine Fung., Dept. Agric. & Comm. Tech. Bull. 4 (1937) 277.

Hymenochaete tristicula (B. & Br.) Massee, Wakefield in Kew Bull. (1916) 73.

Hymenochaete castanea Wakefield! in Kew. Bull. (1914) 260; Saccardo, Syll. Fung. 23 (1925) 528.

Duportella velutina Patouillard in Philippine Journ. Sci. 10 (1915) 87.

Illustrations: Wakefield in Kew Bull. (1914) 260 (as H. castanea).

PLATE 31, young stage; PLATE 32, mature stage.

Resupinate, widely effused, orbicular-confluent, when old sometimes becoming narrowly reflexed at the margin otherwise closely adnate. Hymenium at first chestnut brown, smooth and velutinous, later more waxy, fawn brown, purple-brown or pale ashen, plainly tuberculate and finely reticulately cracked. Margin pale brown rimmed with a very narrow whitish edge, determinate, not very conspicuous in old specimens. In section 200-500 μ thick.

Basidia: 23 40 \times 4 5-7 μ , clavate, at first scattered, immersed among the false setae; later forming a hyaline palisade 5 15 μ wide above the false setae and when fertile sometimes emerging a further 10-13 μ above the general level of the basidia. Sterigmata 4, slightly curved, up to 4 μ long.

Spores: hyaline, oblong or subcylindrical, usually slightly curved, 3 3.5 4 \times 7 8.5 9. 10 μ ; Massee (l.c.) cites them as: "olivaceous elliptical, $10 \times 4 \mu$."

- False setae: deep yellow-brown, darkening in potash, cylindrical, very numerous and densely arranged, fairly thick-walled; apex rounded and sometimes septate, finely rugose; originating as skeletal hyphae and differentiated only by a vertical position and sculptured apex; at first exceeding the hymenial elements, later becoming embedded under them, 3-3·5-4 μ diam.
- Cystidia: thin-walled, fusoid, hyaline, emergent up to 20 μ beyond the basidia, encrusted or almost smooth, 10×40 45 μ , scanty and only found in old specimens.
- Gloeocystidia: ventricose or fusiform, smooth, hyaline, thin-walled, sometimes with a subapical cross septum, $12-25 \times 50 80 \mu$, with granular or homogeneous contents, arising from the basal layers, present at all ages of the fungus.
- Hyphae: (1) Skeletal hyphae, brown, and of the same construction as the false setae but smooth and apparently not septate, loosely interwoven in a horizontal layer. (2) Septate, thin-walled amost colourless, branching, form of generative hyphae, closely arranged between both the skeletal hyphae and the false setae, $2-3 \mu$ wide, conglutinate and indistinct at the junction with the substratum, but not forming a notably differentiated basal layer.
 - Specimens examined: Type in Herb. Berkeley, Ceylon 994, at Kew; 11533, Leighton, on wattle, Buccleuch, Natal, 25/5/1918; 28937, Doidge and Morgan, Donnybrook, Natal, Feb. 1935; 28946, Doidge, Xumeni, Donnybrook, 1935; 27768, Rump (123), on Acacia mollissima, Town Bush, Maritzburg, Aug. 1934; 28492, Rump (272), Town Bush, Maritzburg, Oct. 1934; Höeg (F. 113), on "Syringa" (Melia Azedarach), Maritzburg, (in Herb. Kew); 27553, Rump, Bot. Gard., Maritzburg, 1934; 27628, Rump, Cato Ridge, Natal,

1934; 36706, Talbot, on Dalbergia armata, Kloof Falls, Natal, 31/5/48; 36705, Talbot, Kloof Falls, Natal, 31/5/48; Rump (625), Table Mountain, Natal, 1935.

This species is most closely related to *Stereum Schomburgkii* Berk. (q.v., pg. 43), in the same way as a *Gloeocystidium* or *Peniophora* is related to a *Corticium*, and there is also some macroscopic resemblance between the two species, but *D. tristicula* is thicker, more tuberculate, and hardly reflexed. One wonders nevertheless whether *S. Schomburgkii* would not be more appropriately placed in *Duportella*. Its lack of a basal layer, colour reaction of the false setae with KOH, organisation of the tissues, and general appearance all appear notable pointers to close affinity, and more important than absence of cystidia and gloeocystidia.

The false setae are particularly characteristic of these two species. The writer has not yet seen them in any other species, though they are to some extent paralled in the hymenium of *Stereum percome* B. & Br.! by hyaline hyphae which arise from the skeletal hyphae and become thickly encrusted with heavy yellowish crystals, and also in the cystidia of *Lopharia Dregeana* (Berk.) comb. nov. In *Stereum umbrinum* the cystidia also arise from skeletal hyphae but are clearly differentiated as cystidia and do not darken in potash. In fungi of the *Peniophora laevigata* (Fr.) Massee group, the coloured cystidia are staged throughout the trama, arise as cystidia from the outset, and are not merely apical modifications of skeletal hyphae since these are entirely lacking. These cystidia are not homologous with the false setae of *D. tristicula* and *S. Schomburgkii* though they are approximately the same width and colour, but shorter.

A difference between *D. tristicula* and *S. Schomburgkii* is that the former delays the production of a continuous layer of basidia, whereas the basidia are precocious in the latter species. *D. tristicula* is a fungus in which the body reaches full stature before the complete differentiation of the basidia and cystidia, a fact which Petch [in Ann. Roy. Bot. Gard. Perad. 9 (1925) 259] observes is common in many species of *Stereum*.

DEVELOPMENT IN DUPORTELLA TRISTICULA.

As a result of examination of three old specimens from South Africa, it is now possible to give a new and fuller concept of the development of this species. The specimens referred to are Höeg (F. 113), and Herb. Pretoriae Nos. 27768 and 28492 (in Herb. Kew).

The young stages are orbicular, enlarging by confluence to the effused state found in mature specimens. When young, the colour is a warm argus brown (Ridgway) all over, except at the margin which is paler and bordered by a very narrow whitish band, and the texture and appearance is velvety, smooth and uncracked, the reason for this being that the hymenium is as yet unformed and the surface is composed of the rounded tips of the upright false setae only. Sections show the presence of these false setae arising almost vertically from a narrow, basal, horizontally-woven hyphal layer and also the presence of gloeocystidia, almost all of which are basal in origin. This is the stage which received the name *Hymenochaete castanea* Wakef. Later, on receipt of older specimens, Miss Wakefield [in Kew Bull. (1916) 73] reduced this species to synonymy with *Hymenochaete tristicula* (B. & Br.) Massee.

When the hymenium is formed, the first basidial elements are found spaced out in loose groups between, and exceeded by the false setae, but later the latter are overlaid by a continuous hymenium consisting of basidia in close palisade and occasional projecting, fusoid, rugose or smooth, thin-walled cystidia. Such cystidia are not mentioned in previous descriptions of the species. The fungus by this time has lost its velvety texture and its surface has turned from brown to fawn, or purple-brown, or ashen grey, become rather tuberculate and cracked into innumerable minute reticulate cracks. The margin now is still brown with a whitish rim but is very narrow or indistinguishable. In section it is found that gloeocystidia are still present among the basal tissues, and

that the fungus has thickened by development of a fairly wide intermediate layer of skeletal and generative hyphae between the false setae and the substratum. The hymenial cystidia are evidently formed only in old specimens. The writer has not been able to trace the manner of their formation. One specimen in Herb. Kew (Petch: Herb, Perad, No. 5859) shows admirably every stage in development and the corresponding anatomical changes in section.

The structures called "false setae" above, have been variously referred to in the literature as paraphyses, setae or hyphae. Petch pointed out [in Ann. Roy. Bot. Gard. Perad. 9 (1925) 282] that these structures are merely the tips of hyphae curling upwards, and not specially differentiated, and that they differ from the setae of an Hymenochaete in being relatively thin-walled and immersed in later stages. In the present paper they are considered as continuations of the skeletal hyphae with a slightly rugose and inflated apex. They are called "false setae" here because they darken in potassium hydrate and because their connection with skeletal hyphae can only be seen in very thin sections. This fundamental difference in their origin from the setae of Hymenochaete is, apart from all other considerations, sufficient to justify Duportella as a genus distinct from Hymenochaete, recognition of which has been slow to gain ground in the past.

The basal embedded gloeocystidia have also been known as cystidia, e.g., in Patouillard's diagnosis of the genus, but their structure and position are typical of the bodies now known as gloeocystidia.

HYMENOCHAETE Léveillé.

Key to species described:

Resupinate; setae commonly set in fascicles found throughout the trama 1. H. fasciculata.

Resupinate; setae not fasciculate, found in a layer about 260 μ thick above the trama

2. H. semistupposa.

Reflexed to dimidiate and imbricate, or sometimes resupinate; setae not fasciculate, found in a layer about 160 \(\mu\) thick above the trama. Margin conspicuous ochre colour. Abhymenial surface soft, rubbing ochraceous 3. H. ochromarginata.

1. Hymenochaete fasciculata Talbot apud Wakefield and Talbot in Bothalia 4 (1948) 943. Illustrations: PLATE 33.

Type: 28279, Rump (220), on indigenous wood, Town Bush, Maritzburg, Oct. 1934. In Herb. Kew with isotype in Herb. Pretoriae.

Resupinate, adnate, brittle, cracking on drying, verona brown colour. Hymenium uneven, tuberculate or granular. Width in section 250-400 μ .

Basidia and Spores: not seen.

Setae: entirely embedded, or emergent up to 50 μ , somewhat encrusted, 70-80 (120) \times 6.6-9 μ , deep red-brown, acutely pointed, cylindric to subulate, solitary or set in fascicles (especially at the papillae) of 8-12 setae. Setigerous layer not differentiated; setae found throughout the tissues.

Hyphae: light yellow-brown, 1 μ wide, mostly very much branched with short side branches, dendroid, bordered on the abhymenial side by a narrow dark seam. In places two such seams are seen as though the fungus has renewed its growth and become secondarily thickened.

Specimens examined: Type, cited above; 28500, Rump (262) Town Bush, Maritzburg, Oct. 1934.

This species falls in a group with H. corrugata (Fr.) Lév. and H. fuliginosa (Pers.) Bres. on account of the lack of differentiation of hyphal and setigerous layers, but it is immediately distinguished by the highly characteristic fasciculate setae. The specimen No. 28500 has a rather smoother hymenium than the type and fasciculation is not quite so marked.

H. lictor Petch! [in Ann. Roy. Bot. Gard. Perad. 9 (1925) 277], which was at one time confused with H. fuliginosa, also has fasciculate setae. Its type differs from the new species as follows: (1) a smoother, more reddish hymenium; (2) fewer setae per fascicle (up to 6) and the fascicles not very dense; (3) lighter context colour and a light yellow basal seam; (4) conspicuous cavities in the trama; (5) the hyphae in H. lictor are not quite so narrow nor so dendroid as those of H. fasciculata.

Hymenochaete cervina B. & C.! of the same group, differs in being thinner, paler coloured, and without fasciculate setae, but in other respects it is close. It is found in East Africa [Uganda: Dummer (4038); Small (227); in Herb. Kew]. Possibly H. fasciculata is an extreme form of H. cervina but no intermediates have yet been discovered.

2. Hymenochaete semistupposa Petch! in Ann. Roy. Bot Gard. Perad 9 (1925) 278.

Illustrations: PLATE 34.

Type: Herb. Perad. No. 5627, in Herb. Kew.

Resupinate, effused, separable when moist, brittle when dry, vertically fibrillose when broken across, up to $900 \, \mu$ thick. Hymenium smooth, little cracked, dark verona brown. Margin cinnamon-rufous, thinner. Forming a pocket rot of the underlying wood.

Basidia and Spores: not seen.

Setae: arising in all parts of a setigerous layer about 260 μ thick, which may show one or two interrupted strata of darker material. Setae fusoid to subulate, deep yellow-brown, apex pointed, $45-70 \times 5 \cdot 6 \cdot 8 \cdot 4 \mu$, emergent up to 30 50 μ , or immersed.

Hyphae: yellow-brown, branched, septate, without clamp connections; those in the setigerous layer vertical, closely arranged, 3 μ wide, lightly coloured; intermediate hyphae loosely interwoven, $2 \cdot 8 - 3 \cdot 5$ μ wide, with appreciably thick walls but a wide lumen, the walls being straight, wavy or constricted in outline, when constricted having a moniliform appearance. Basal hyphae closely massed in a dark seam, horizontal, 70-200 μ wide.

Specimens examined: 30232, Rump (453), Krantzkop, Natal, Nov. 1935; Maitland (517), Gongoni Forest, Kenya, Sept. 1920; Petch (5657, 4044, 5107), Hakgala, Ceylon.

In microscopic structure this South African collection is a close match with the Type specimen from Ceylon, though the setae in the former are rather more subulate than fusoid. In the Type, the intermediate hyphae do show an occasional wavy outline but they are never moniliform. The monilioid constrictions are quite plain in parts of the Kenyan specimen and reach their highest development in the South African specimen. There is insufficient reason for separating these African examples as a distinct new variety. The colour of all these specimens is rather variable even in a single collection. The typical colour is an olivaceous Prout's brown with a cinnamon margin, but it is often a warmer shade of reddish-brown or even darker.

3. Hymenochaete ochromarginata Talbot apud Wakefield and Talbot in Bothalia 4 (1948) 944.

Illustrations: Plate 35.

Type: 2133, Pienaar, Tenadu, Tembuland, 26/2/1912. In Herb. Kew with isotype in Herb. Pretoriae.

Narrowly resupinate, mainly reflexed to dimidiate, tough, not pliable, laterally connate, imbricate, 4×2 cm. Upper surface concentrically furrowed, with velvety pubescence, light bay colour, rubbing away to yellow ochre. Hymenium smooth, warm argus brown, not cracked, somewhat reflecting the surface furrows. Margin acute, with bright yellow ochre band less than 1 mm. wide. Width in section 500-650 μ . Basidia and Spores: not seen.

Setae: emergent, or fully immersed in a layer up to 160 μ thick, yellow-brown, subulate, 30-45 \times 6-8 μ , with narrow lumen, emergent up to 20 μ .

Hyphae: yellow-brown, narrow, $1\cdot 5-2\cdot 5$ μ diam., much interwoven and more or less horizontal in the greater part of the trama. Trama bordered on both sides by a seam of dark closely-woven hyphae, the seam not very pronounced on the setigerous side, being only conspicuous in rather thick sections.

Tomentum: on the upper surface, confluent with and exactly similar to tramal hyphae.

Specimens examined: Type, cited above; 30260, Morgan and Doidge, Donnybrook Natal, 1936; 28879, Bottomley, The Cavern, Drakensberg, Natal, 20/7/1937; Maitland (93), Cameroon Mountains, Cameroons, 1930 (in Herb. Kew, filed under unnamed Hymenochaete).

In structure this species comes within the small group which includes H. rigidula B. & C. !, H. tabacina (Sow.) Lév., and H. rubiginosa (Dicks.) Lév. There is no likelihood of confusion with H. tabacina. H. rubiginosa may be distinguished by longer, narrower setae (50 60 \times 5 6 μ), by its colliculose bistre hymenium, and wider hyphae (2·5 μ), but especially by becoming indurated and blackish on the abhymenial surface. In H. ochromarginata the surface remains ochraceous and soft. The hyphal width in H. ochromarginata is more variable than was supposed at the time of first describing the species, and should not be over-emphasised. H. rigidula differs in being predominantly resupinate and having sensibly darker, wider hyphae (3 4 μ).

In Herb. Kew are several specimens from Ceylon under *H. rigidula* B. & C. (Nos. 3042, 6670, 3866, 6058, 4031) which differ from the type of *H. ochromarginata* only in hymenial colour. Petch [in Ann. Roy. Bot. Gard. Perad. 9 (1925) 272] gives notes on *H. rigidula* and concludes: "It would seem probable that the Ceylon species is not the same as that from Cuba," (type locality). As the hymenial colour of *H. ochromarginata* in South Africa varies from warm argus brown to almost the bistre of *H. rubiginosa*, Petch's specimens lie within this colour range and should be regarded as *H. ochromarginata*.

SYNONYMS AND EXCLUDED SPECIES IN THE GENUS HYMENOCHAETE.

tristicula B. & Br. = Duportella tristicula (B. & Br.) Reinking, q.v.

INCORRECT RECORDS OF HYMENOCHAETE SPECIES IN SOUTH AFRICA.

luteobadia (Fr.) Höhnel and Litsch. Recorded in Grevillea 10 (1881) 58 sub Stereum. The specimen referred to is in Herb. Kew under Hymenochaete, but is actually Stereum fasciatum Schw. (Hymenochaete luteobadia is, however, found in South and East Africa.)

tenuissima Berk.! Specimen No. 15596 (Natal Herbarium, 290) is a polypore. It would seem that the specimen was misplaced at some time, for v. d. Byl refers to this collection in S.A. Journ. Sci. 18 (1921) 347 and gives a particular note on its thin, flexible structure, whereas the present specimen is a thick polypore, namely *Polystictus tabacinus* Mont.

RESUPINATE SPECIES OF HYMENOCHAETE RECORDED FOR SOUTH AFRICA BUT NOT AVAILABLE FOR STUDY.

fusco-violascens (Mont.) Sacc.; Montagne in Ann. Sci. Nat. ser. 3, 7 (1847) 174, sub *Thelephora*; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 14.

rubiginosa (Schrad.) Lév.; Van der Byl (1929) l.c., p. 14; Massee in Journ.L inn. Soc. Bot. 27 (1890) 97; Eyles in Trans. Roy. Soc. S.A. 5 (1915) 277, (Rhodesia); Montagne in Ann. Sci. Nat. ser. 3, 7 (1847) 174, sub Stereum rubiginosum Fr.

There are many unmatched collections of *Hymenochaete* in Herb. Pretoriae. The writer could not match them at Kew, and he considers that comparison with North American collections is necessary. Most collections of *Hymenochaete* lack basidia and spores and the genus presents unusually great difficulty.

ASTEROSTROMELLA von Höhnel and Litschauer.

1. Asterostromella duriscula (B. & Br.) comb. nov.

Stereum duriusculum Berk. and Broome! in Journ. Linn. Soc. Bot. 14 (1873) 66; Saccardo, Syll. Fung. 6 (1888) 585; Bourdot and Maire in Bull. Soc. Myc. de Fr. 36 (1920) 74; Petch in Ann. Roy. Bot. Gard. Perad. 9 (1925) 267. [non S. duriusculum sensu Bresadola in Ann. Myc. 6 (1908) 43, nec S. duriusculum Bres. sensu Overholts in Mycologia 30 (1938) 279.]

Illustrations: PLATE 36.

Resupinate effused, up to 1.5 mm. thick, tough, fibrous-suberose. Context pale creamy white to pale yellowish-brown, markedly stratose. Hymenium very smooth, creamy to chamois colour, sometimes pruinose with the spores.

Basidia: scattered, not in palisade, exceeded by the hymenial hyphae, about $4 < 24 \ \mu$. Spores: globose-subglobose, often with a blunt apiculus, smooth, hyaline, $6.6.8 \ \mu$ diam. Gloeocystidia: thin-walled, with large irregularly shaped contents staining readily with phloxine, embedded fairly deeply or in the plane of the basidia, reaching maximum size of $6.8 \times 120 \ \mu$, usually about $4 \times 48 \ \mu$, rare or abundant depending on the specimen.

Context: zoned with alternate hyaline and pale yellowish zones, the hyaline part (fide Petch) being the lower part of each growth zone.

Hyphae: thick-walled or without visible lumen, hyaline, very finely filamentous or up to 3 μ wide, very much branched but not true dichophyses.

Minerals: concretions common in lower layers, especially at the junction of growth zones.

Specimens examined: Type, Thwaites (569 and 329) in Herb. Kew, Ceylon; 27604, Rump (25), Town Bush, Maritzburg, 1934; 30208, Rump (409), Umhlali, Natal, 1935; 30209, Rump (410), Compensation Beach, Natal, Dec. 1934; 30210, Rump (411), Umgeni Bush, Durban, March, 1935; 35423, Rump (741), Richmond, Natal, March, 1945; 34360, Rump, Karkloof, Natal, 1936; 36429, Rump, Maritzburg, May 1947; 35324, Rump (591), Isipingo Beach, Natal, 1944; 28473, Rump (191), Winterskloof, Natal, 1934; 33902, Rump (534), Scottburgh, Natal, Feb. 1943; 30823, Rump (479), Port St. Johns, Pondoland, Aug. 1937; 34543, Scott, Munnik Tzaneen Road, 27/5/1943; 33993, Rump (675), on Euphorbia pulcherrima (Poinsettia), Maritzburg, 1943; Rump (796), Verulam, Natal, 1946; Glaziou (12333), Rio Janeiro, Brazil; Alban Stewart (975), Galapagos, 1905; J. Peres Guimarais, Lourenco Marques, P.E. Africa, 23/3/1940 and 18/3/1940.

Asterostromella duriuscula belongs to a group of stratose resupinates of which Corticium portentosum B. and C. ! is another example. The taxonomy of the group is confused. In this group the characters of taxonomic importance are: (1) Context colour; (2) Nature of the branching of the hyphae; (3) Colour of hyphae, and their reaction with KOH; (4) Presence or absence of gloeocystidia; (5) Colour and sculpturing of spores. Of little taxonomic value are: (a) Width, septation, and thickness of the hyphal walls; (b) Hymenium colour (useful for A. dura); (c) Thickness and degree of stratification of the context; (d) Spore size, for all the spores in this group are almost globose and about $(5 \cdot 5)$ -6-6·5-(8) μ in diameter.

For comparative studies a standard mounting technique was used. Sections were mounted in a drop of concentrated hydrochloric acid (to clear minerals) which was then drained away and replaced by 10° , KOH until bubbling ceased. Two such alkaline mounts were made, one with the addition of phloxine stain and the other without. For examining the branching of hyphae the sections were teased out with needles.

The species examined can conveniently be classified in the following manner: (see also PLATE 37)—

- Group 1. A: Context white or light yellowish; sections not darkening in KOH. Hyphae hyaline, much branched, dendrophytic not dichophytic.
- Group 1. B: Differing from 1. A in having dichophytic hyphae, which are hyaline or very lightly coloured and darken very slightly in KOH.
- Group 2: Context not light coloured; sections darkening in KOH. Hyphae coloured, markedly dendroid.
- Group 3: Context not light coloured; sections darkening slightly in KOH. Hyphae hyaline or very dilutely coloured, dendroid, not dichophytic.

GROUP 1. A.

- (a) Corticium portentosum B. and C. ! (=C. diminuens B. and C.).
- (b) Stereum duriusculum B. and Br. !

The most significant difference between these two very similar species is one which does not appear to have been recorded previously, namely that there are gloeocystidia in S. duriusculum, which cannot be found in any North American specimens the writer has examined in this group, including the type of C. portentosum. The gloeocystidia are difficult to demonstrate but they are present in the type of S. duriusculum, and are most numerous and conspicuous in some South African specimens which are filed under both species in Herb. Kew. Two collections from Lourenco Marques are interesting in that they were both found at about the same time and locality, yet in one the gloeocystidia are abundant and in the other very rare. Examples with gloeocystidia are also found from Ceylon (Type of S. duriusculum), the Galapagos, and Brazil.

It was first considered that the character of gloeocystidia taken alone did not warrant the retention of C. portentosum and S. duriusculum as distinct species, it being well known that such structures are not necessarily found in all specimens of a single species. But there are indications that the two species should not be merged. The type specimens differ in hymenial colour, C. portentosum being a somewhat lighter chamois, and in width of hyphae, S. duriusculum having doubly wide hyphae. These characters are not very helpful because intergrading variations are common. Most specimens the writer assigns to S. duriusculum on the grounds of having gloeocystidia, give an immediate jet black colour if the hymenium is touched with a drop of KOH, while most assigned to C. portentosum react by developing a reddish-brown colour which slowly darkens. But again, this chemical test is not invariable. Some of the South African specimens of S. duriusculum are rich in mineral concretions at the junction of the strata. This, too, is a variable feature. The writer has not yet seen an example of C. portentosum from South Africa, for all those in Herb. Kew he would call S. duriusculum. It seems probable that C. portentosum is a North Temperate species and predominantly American.

Certain other fungi have been confused, or merged properly or improperly with these two:—

Corticium diminuens B. and C.! is given by Höhnel and Litschauer [in K. Akad. Wiss. Wien. Sitzungsb. (1907) 743] as a synonym of C. portentosum. I consider this is substantiated. It is significant that the species is known only from Alabama, North America.

Corticium grammicum P. Henn. is cited in the same place as another synonym. No material of this was available for study, but in Saccardo, Syll. Fung. 21 (1912) 395 and in Engler Jahrb. 38 (1905) 106 the spores are given as "ellipsoidal, 2·5·3 × 2 \(\nu_i\)," which indicates that Höhnel's statement of synonymy should be further enquired into.

Stereum duriusculum has evidently been confused both by Burt and by Bresadola. The latter has written on the type sheet in Herb. Kew that C. portentosum, S. duriusculum and S. induratum Berk.! are all the same species, and in Ann. Myc. 14 (1916) 232 he gives S. albo-cinctum B. and Br.! as a synonym of S.

duriusculum. It is plain on examination that S. induratum and S. albo-cinctum belong in Group 2 of this treatment, and that S. duriusculum sensu Bresadola is Asterostromella dura Bourdot and Galzin.

Burt [in Ann. Mo. Bot. Gard. 7 (1920) 236] says that *S. duriusculum* "as determined by Patouillard in Duss, Fl. Antilles Fr. 232. 1903, is probably *Hypochnus pallescens* (Schw.) Burt, a species common in the West Indies." Burt draws his description of the latter species from authentic material in the Curtis Herbarium. The material in Herb. Kew (7412) sent by Curtis to Berkeley and labelled in the latter's handwriting as "*Thel. pallescens* (a), Herb. Schwein. !" cannot be considered authentic, for it is actually a *Peniophora* bearing very large, thick-walled, encrusted cystidia, conical in shape. Examination of recent American material which coincides with Burt's descriptions shows that this species has nothing to do with *S. duriusculum* but falls in Group 2 of this treatment.

GROUP 1. B.

In Herb. Kew, under *C. portentosum* are a series of three Swedish collections ex Mus. Botan. Stockholm, Nos. 1523, 1334 and 4135, which the author considers distinct from *C. portentosum* for the reason that their hyphae are truly dichophytic. These specimens, then, belong to *Asterostromella* and possibly represent a new species.

GROUP 2.

- (a) Stereum induratum B. and C. ! (=S. albo-cinctum B. and Br. !). This species lacks the tissue differentiation of a Stereum and possesses dichophytic hyphae.
- (b) Asterostromella dura Bourd. and Galz. (=S. duriusculum sensu Bresadola). Differs from the above in greater thickness, darker context, and ochraceous hymenium colour. The two are obviously very closely related. This species is the type of the genus Dichostereum proposed by Pilát [in Ann. Myc. 24 (1926) 223] as a segregate from Asterostromella. Rogers and Jackson [in Farlowia 1 (1943) 310] make this species a synonym of Vararia pallescens (Schw.) Rogers and Jackson. This may well be so, but for the present the writer prefers to keep the two species separate, as he believes that they differ in colour and closeness of branching of the hyphae.
- (c) Hypochnus pallescens (Schw.) Burt. [Synonyms: Coniophora sordulenta (Cooke and Massee) Sacc. !; Hypochnus thelephoroides (Ellis and Everh.) Burt, fide Burt; Thelephora insinuans Schwein., fide Burt.]

This species is an Asterostromella.

The above three species would all fall into the genus *Dichostereum* of Pilát (l.c.), who mentions the species *induratum*, *albocinctum*, and *duriusculum* in this connection; but it is plain that he has taken *duriusculum* in the sense of Bresadola. The present writer includes *Dichostereum* in the genus *Asterostromella*.

GROUP 3.

Asterostromella Rumpiana Talbot, which see (page 54).

There remains to assign *C. portentosum* and *S. duriusculum* to a suitable genus, for it seems that they fit neither *Stereum* nor *Corticium* and that their affinities lie wholly with the rest of this group of stratose resupinates. I propose, therefore, that both should be referred to the genus *Asterostromella* despite the fact that they possess hyphae which are not the dichophyses of *Asterostromella*, but rather dendrophyses of the kind found in some species of *Aleurodiscus*. *Aleurodiscus* as constituted at present is a repository for many unrelated species distinguished by possession of pseudophyses, dendrophyses or acanthophyses but with very little else in common, and it would only add to the muddle to include two more species on these very slender grounds alone. *Asterostromella* itself is a somewhat polyglot genus, but the time does not yet appear ripe for making segregations of the kind of *Dichostereum*.

Donk [in Rev. Ned. Hetero.-en Homobas.-Aphyll. 1 (1931) 191] points out that *Vararia* Karst. is an earlier name for *Asterostromella* Höhnel and Litsch., and that if the latter is to be retained, conservation against the former is necessary.

2. Asterostromella Rumpiana Talbot apud Wakefield and Talbot in Bothalia 4 (1948) 939.

Illustrations: Plate 38.

Type: 30200, Rump (399), Nkandhla Forest, Zululand. In Herb. Kew, with isotype in Herb. Pretoriae.

Resupinate, widely effused, adnate, up to 2 mm. thick. Context tough, corkyfibrous, markedly stratose, light biscuit-brown colour. Hymenium smooth, with buffy colour unmatched in Ridgway, turning black instantly on application of KOH. Basidia: scattered, not in palisade, clavate-cylindric, about $4\cdot 5\times 30~\mu$, exceeded by the hymenial hyphae.

Spores: elliptic-oval (not ovate), hyaline, $5.5 \times 8.3 \mu$, with granular contents giving a finely punctate appearance.

Gloeocystidia: thin-walled, with homogeneous, evenly staining contents, embedded, $6.5 \times 53-80 \mu$.

Hyphae: thick-walled or without visible lumen, hyaline or lightly coloured, darkening slightly in KOH, filamentous or up to 3 μ wide, very much branched but not dichophytic.

Context: zoned with alternate lighter and darker zones.

Minerals: common at the junction of the strata.

Specimens examined: Type, 30200, cited above.

In structure this species is very close to A. duriuscula, from which it differs in darker colour of the context, spore size and shape, and the more homogeneous contents of the gloeocystidia. Corticium himuleum Bres. [in Hedwigia 56 (1915) 303] from the Philippines may be closely related, but specimens have not been seen.

ASTEROSTROMA Massee.

Asterostroma cervicolor (B. and C.) Massee in Journ. Linn. Soc. Bot. 25 (1889) 155;
 Bourdot and Galzin in Bull. Soc. Myc. de Fr. 36 (1920) 45, Hym. de Fr. (1928) 400;
 Burt in Ann. Mo. Bot. Gard. 11 (1924) 28; Saccardo, Syll. Fung. 9 (1891) 237.

Corticium cervicolor Berk. and Curt. ! in Grevillea 1 (1873) 179; Saccardo, Syll. Fung. 6 (1888) 621.

Asterostroma corticola Massee! in Journ. Linn. Soc. Bot. 25 (1889) 155.

Asterostroma albido-carneum Massee! in Journ. Linn. Soc. Bot. 25 (1889) 155, non Thelephora albido-carnea Schwein.

Asterostroma pallidum Morgan in Cincinnati Soc. Nat. Hist. Journ. 18 (1895) 38, (fide Burt).

Illustrations: Massee (1889) 1.c., Pl. 46, f. 8, 9, as A. albido-carneum; Morgan (1895) 1.c. Pl. 1, f. 6, as A. pallidum.

PLATE 39.

Entirely resupinate, fawn, byssoid when young with a whitish arachnoid margin, effused, adnate. Hymenium fawn-avellaneous becoming pallid buff when sporing, pulverulent, smooth.

Context thin, 150-300 μ , spongy and dry.

Basidia: $16-23-53 \times 6.6 \mu$ or narrower, with 2-4 short sterigmata, subcylindric or clavate, in an uneven palisade.

Spores: hyaline, echinulate, subglobose, 4–5 μ diam., or oblong, 4 \times 6 μ .

Asterosetae: throughout the trama, fewer and much smaller in the hymenium and occasionally projecting slightly beyond it; each star composed of about 5 rays borne on a thin hypha. Rays $15-70\times3-3\cdot5$ μ , light brown, the majority unbranched, pointed, largest in the basal layers.

Gloeocystidia: demonstrable with phloxine stain, numerous, immersed in subhymenium or projecting, fusoid or clavate, frequently attenuated into a long neck, $8-12 \times 30-45-50 \mu$, contents homogeneous.

Other ground tissues: hyphae hyaline but quite indistinct.

Specimens examined: Type, *Peters* (4026), Alabama (in Herb. Kew); 30155, *Rump* (348. a) on the hymenium of a *Fomes* sp., Umgeni Bush, Durban, March 1935; 36821, *Rump* (469), Van Reenen, Natal, Jan. 1937; 34387, *Rump* (602), Town Bush, Maritzburg, May 1936.

In the last two specimens cited above, the rays of the asterosetae radiate from quite a stout central boss, and there is rather more branching of the rays than is typical. Otherwise these specimens are no different from A. cervicolor.

MYCOLEPTODON Patouillard,

1. Mycoleptodon ochraceum (Pers. ex Fr.) Patouillard, Essai Taxon. sur les Hym. (1900) 116; Rea, Brit. Basid. (1922) 639; Pilát in Bull. Soc. Myc. de Fr. 42 (1926) 102; Bourdot and Galzin, Hym. de Fr. (1928) 440.

Hydnum ochraceum Pers. ex Fr., Systema Myc. 1 (1821) 414, Hym. Eur. (1874) 612; Persoon apud Gmelin in Linne, Systema Naturae 2 (? 1796) 1440; Persoon, Syn. Meth. Fung. (1801) 559, T.5, f. 5, Myc. Eur. (1825) 176, Obs. Myc. 1 (1796) 73; Bresadola, Fung. Kmet. (1897) n. 98, in Ann. Myc. 1 (1903) 85; Saccardo, Syll. Fung. 6 (1888) 457.

Steecherinum ochraceum (Pers.) S. F. Gray, Nat. Arr. Brit. Plants 1 (1821) 651; Miller in Mycologia 25 (1933) 296.

Leptodon ochraceum (Pers. ex Fr.) Quélet, Fl. Myc. de Fr. (1888) 441.

Hydnum pudorinum Fries, Hym. Eur. (1874) 612, Elenchus Fung. 1 (1828) 133; Saccardo, Syll. Fung. 6 (1888) 456; Quélet, Fl. Myc. de Fr. (1888) 440.

Hydnum microdon Persoon, Syn. Meth. Fung. (1801) 561; Bresadola in Ann. Myc. 1 (1903) 85.

Hydnum Daviesii Sowerby, Engl. Fung. 1 (1797) 15; Saccardo, Syll. Fung. 6 (1888) 457. (Fide Persoon and others.)

Hydnum alnicolum Velenovsky (fide Bourd. and Galzin).

Illustrations: Persoon, Syn. Meth. Fung. (1801) T.5, f.5; Sowerby, Engl. Fung. 1 (1797) T. 15, as H. Daviesii.

PLATE 40.

Resupinate, effused, becoming reflexed, or even pileate (not yet seen in South Africa), readily separable from substratum. Reflexed upper surface pale coloured, concentrically furrowed, tomentose. Hymenium light ochraceous with a light fleshy tint; composed of very closely arranged regular subulate small teeth, shorter towards the margin. Margin whitish, narrow, subfimbriate, in section 250 400u thick excluding the teeth.

Basidia: $3.5 \ 4 \ < 12 \ 15$ (18) μ , clavate, with very short straight sterigmata. Spores: not yet seen in South African material: $3.4 \ (5) \times 2.2.5 \ \mu$, obovate-oblong.

Cystidia: numerous, long-clavate or fusoid, thick-walled, covered at least near the apex with easily detersile incrustation, $6.5\ 10\ imes\ (40\ 55)\cdot 105\ \mu$, arising from ordinary deep-seated hyphae as terminal modifications near the hymenium.

Hyphae: subhymenial hyphae more or less thin-walled; tramal hyphae thick-walled, $(2)-2\cdot 5-4$ μ , colourless, distinct, suberect, densely interwoven.

Specimens examined: 27796, Rump (82), Town Bush, Maritzburg, Aug. 1934; Simpson and Talbot (T.R.L. 2021), Qudeni Forest, Zululand, Feb. 1945.

In Grevillea 10 (1881) 27 and in S.A. Journ. Sci. 13 (1917) 440, reference is made to a collection of Medley Wood (479), Inanda, Natal, as *H. ochraceum*. I have been unable to find cystidia in this specimen and therefore suggest that it is some other species.

LOPHARIA Kalchbrenner and MacOwan.

1. Lopharia mirabilis (B. and Br.) Patouillard in Bull. Soc. Myc. de Fr. 11 (1895) 14, Pl. 1, Essai Taxon. sur les Hym. (1900) 74; van der Byl in Ann. Univ. Stellenbosch 12 (1934) 2, f. 1.; Petch in Ann. Roy. Bot. Gard. Perad. 4 (1910) 410.

Radulum mirabile B. and Br. ! in Journ. Linn. Soc. Bot. 14 (1873) 61; Saccardo, Syll. Fung. 6 (1888) 496.

Thwaitesiella mirabilis (B. and Br.) Massee in Grev. 21 (1892) 3.

Lopharia lirellosa Kalchbr. and MacOwan! in Grev. 10 (1881) 58; Patouillard in Bull. Soc. Myc. de Fr. 11 (1895) 14, Pl. 1, Essai Taxon. sur les Hym. (1900) 74. Licentia yao-chanica Pilát in Ann. Myc. 38 (1940) 66, text fig. 2, Tab. 1, f. 1, 2, 3.

Illustrations: Patouillard (1895) l.c.; v. d. Byl (1934) l.c.; Pilat (1940) l.c.

PLATE 41.

Resupinate, effused, sometimes reflexed, slightly waxy when fresh, drying thin and coriaceous, brittle. Upper surface (when exposed) tomentose and obscurely zoned, tan colour. Hymenium first smooth and white, then creamy to ochraceous with light margin, and covered with scattered, erect, laterally compressed, triangular teeth, about $0.5\,$ mm. high, arranged in more or less radial or concentric patterns: teeth coalesce into short ridges. Thickness of context (excluding ridges) $250-300\,\mu$.

Basidia: large, clavate, $50-65 \times 9-11 \mu$, with 4 sterigmata.

Spores: oblong-elliptic or oblong-ovate, occasionally curved, hyaline, smooth, with rather granular contents, (5)- $6 \cdot 6 - 8 \cdot 3 \times 10 - 13 \cdot 2 \mu$.

Cystidia: present throughout the hymenium and just below it, conical or subfusiform, $66-130 \times 13\cdot 21~\mu$, usually emergent up to $50~\mu$, very thick-walled, coarsely encrusted in the superior half, often smooth and pale brownish at the base, blunt or pointed at the apex.

Hyphae: closely interwoven, more or less erect, thick-walled, $3.4~\mu$ wide, subtended on the side next to the substratum by a thin layer of horizontal faintly-coloured hyphae.

Surface Hairs: adpressed, faintly coloured, 4 μ wide.

Specimens examined: MacOwan, type of Lopharia lirellosa, C. Bon. Spei; Thwaites (328), type of L. mirabilis, Peradeniya, Ceylon, 1868; ex Herb. von Höhnel, Peradeniya, Ceylon, 1907; van der Byl (2261), South Africa, 1926; 27797, Rump, Town Bush, Maritzburg, 1934; 28302, Rump, Town Bush, Maritzburg, Oct. 1934; 27799, Rump, near Maritzburg, 1934; Rump (v. d. Byl, 2620), Natal South Coast, Feb. 1931; v. d. Byl (551), on dead Plectronia, Durban; v. d. Byl (1429), South Africa; 27769, Rump (125), Town Bush Valley, Maritzburg, Aug. 1934; 31911, (Natal. Herb. 714), v. d. Byl, Bluff, Durban, 6/8/1917; 31356, Duthie, Knysna; 31309, Duthie, Knysna; ex Herb. T. Petch (Nos. 4499, 3306, 5354), Peradeniya, Ceylon; Sappan, Flor. Singapore 5119, Singapore Bot. Gard., 1919; F. T. Brooks (113), Fed. Malay States, 1914; M. Noor, Flor. Selangor 5559, 1920; T. F. Chipp, Flor. Singapore 5910, 1920; R. E. Holttum (9240), Malay Peninsula, 1922.

This species is of peculiar interest as a link between other genera both of the Hydnaceae and the Thelephoraceae. It has the internal structure of a Stereum of the "Lloydella" group (Bresadola), and in particular a very marked similarity to S. cinerascens (see pg. 41). The last-named is thicker and has deeper-embedded cystidia, but its other microscopic features including spore size and shape are the exact counterpart of L. mirabilis. But for the fact that this is resupinate, it also connects with Cladoderris which has a papillate hymenium and, in some species, cystidia. Cladoderris cystidia are usually small, but Lloyd [Myc. Writ. 4 (1913) 11] says that in C. Pritzelii Hennings these are large "metuloids." The structure of L. mirabilis with a darker compact zone adjacent to the substratum, and hairs, even when apparently resupinate, is evidence that the fungus is capable of reflexion, and distinguishes it from Peniophora. Though Lopharia is grouped next to Radulum in the Hydnaceae on account of its incised ridges, the writer considers it certainly more nearly related to the Thelephoraceae through the genus Stereum.

Hymenial configuration in *L. mirabilis* is variable. One specimen in Herb. Kew has a distinctly poroid hymenium and could be taken for a *Poria*. The disposition of hymenial crests irregularly or in somewhat concentric rings was taken by Patouillard as the basis for separating *L. lirellosa* and *L. mirabilis*, but this is now considered untenable. In the type specimens of these, the writer has found that the spores show a distinct difference in size and shape [*L. lirellosa*, $6 \cdot 6 - (8 \cdot 3) \times (9 \cdot 9) - 13 \cdot 2 - (15) \mu$, mostly elliptical; *L. mirabilis*, $5 \times 9 \cdot 9 \cdot (13 \cdot 2) \mu$, mostly almost cylindric with flattened sides], but these are evidently extremes, for in examination of other collections from South Africa and Ceylon it is seen that the spore sizes and shapes intergrade. The spores in South African material are nevertheless slightly larger and wider than those from Ceylon, but not significantly so. The following summary of spore measurements by different observers is of interest (Table 4).

TABLE 4.

SPORE MEASUREMENTS OF CERTAIN LOPHARIA SPECIES.

Fungus.	Spore Size in μ.	Observer.
L, lirellosa	8-10 × 15-17	Patouillard.
L, lirellosa	8-10 × 12-14	Van der Byl.
L, lirellosa (Type)	6·6-(8·3) × (9·9)-13·2-(15)	Talbot.
L. mirabilis	4-5 × 8-12	Petch.
L. mirabilis	5 × 9	Massee.
L. mirabilis	5-6·5 × 9-10	Höhnel.
L. mirahilis (Type)	5 × 9·9-(13·2)	Talbot.
L. yao-chanica	6-8 × 10-15	Pilát.

Lopharia javanica P. Henn. has large cystidia too, but spores measuring only 5-6 \times 5 7 μ ,: Lopharia Dregeana (Berk.) comb. nov. (see following) has smaller cystidia of a different kind, and spores $4\cdot5-5\times6\cdot5-7$ μ .

2. Lopharia Dregeana (Berk.) Talbot comb. nov.

Corticion Dregeanum Berkeley! in Hooker's Lond. Journ. Bot. 5 (1846) 3; Saccardo, Syll. Fung. 6 (1888) 636; Montagne in Ann. Sci. Nat. ser. 3, 7 (1847) 174.

Hymenochaete Dregeana (Berk.) Massee in Journ. Linn. Soc. Bot. 27 (1890) 114.

Illustrations: PLATE 42.

Type: Drège (9451. c), South Africa. In Herb. Kew.

Resupinate, effused, not adnate, somewhat flexible, at first orbicular then confluent. Margin determinate, smooth, somewhat paler than the remainder, becoming a little reflexed, the reflexed side softly byssoid. Hymenium considerably papillate or with incised ridges, dry, pruinose, cracked or uncracked, colour varying from rosy-violaceous or pale ochraceous with a faint vinous tinge to brownish. Context pale, about 400 $^-$ thick. Basidia: clavate-cylindric, 3-3·5 \times 15 20-26 μ , in close palisade and difficult to observe. Spores: hyaline, smooth, elliptical, 4·5-5 \times 6·5-7 μ .

Cystidia: cylindrical, hyaline to very dilutely coloured, thick-walled, the lumen often expanding towards the apex, minutely encrusted more usually in the upper third of the length, very numerous, entirely immersed or emergent up to 27 μ , arising as apical continuations of ordinary hyphae deep in the trama, not darkening in KOH, (5)-6-8 μ wide, up to 170 μ long.

Hyphae: hyaline, thick-walled with very narrow lumen, rather vitreous, 5-6.5-8 μ wide, closely intertwined without showing a well-defined basal or median tissue in the trama.

Specimens examined: Type, *Drège* (9451. c), cited above; *Drège* (4109), C.B.S., ex Herb. Montagne; *Dunlap*, Cameroon Mtns., 5000' alt., 1926. In Herb. Kew.; *Macdonald*, Ngong Forest, Nairobi, Kenya, 24/5/29.

Massee (1890 l.c.) wrote of this species that it is a true *Hymenochaete*, but both in origin and morphology the accessory organs of this fungus must be taken as cystidia and not as setae. The cystidia arise as apical modifications of thick-walled, deep-seated hyphae curving outwards, and in this respect they are of a rare kind whose origin may be compared with that of the false setae in *Duportella tristicula* and *Stereum Schomburgkii*, though no affinity is to be implied from this.

Microscopically all the specimens of *L. Dregeana* cited above are identical, but they differ somewhat in external colour and particularly in the hymenial crests. The Drège specimens have mere papillae scattered roughly concentrically over the hymenium; the Macdonald specimen has incised ridges, and in places is almost poroid; there are closely arranged incised ridges in the Dunlap specimen. In view of these incised ridges and the presence of cystidia I have referred the species to *Lopharia*. This choice of genus is not entirely satisfactory, for the following reasons:—

- (1) The cystidia of both other known species of *Lopharia* (*L. mirabilis* and *L. javanica*) are very large, fusoid or subulate, peniophoroid, and not merely apical modifications of ordinary hyphae.
- (2) Lopharia is possibly not a "good" genus. Under L. mirabilis it has been shown that the hymenial configuration is very variable, and that its affinities lie with the Thelephoraceae, particularly with Stereum cinerascens.
- (3) L. Dregeana is composed throughout of uniformly interwoven hyphae without differentiation into a denser basal layer and hairs as in L. mirabilis.
- (4) A fifth specimen in Herb. Kew [Viz. Maitland (143), Cameroon Mtns., March 1931] has the same microscopic features as L. Dregeana and the same violaceous tint, but is widely reflexed with a zonate abhymenial surface. It also has the long separated teeth of a Hydnum. The writer places this specimen only tentatively with L. Dregeana, there being a trifling difference in length and incrustation of the cystidia which causes him uncertainty.

Corticium Dregeanum was said by Saccardo (l.c.) to be near to Corticium molle Fr., but from the description this can only be a superficial resemblance and takes no account of the much more hydnoid collections of the former which have now come to light.

A specimen in Herb. Kew (J. B. Ellis, 3723, Iowa) included as *Hymenochaete Dregeana* is misdetermined. It is almost certainly *Stereum cinerascens* (Schw.) Massee, and is interesting in showing a few small papillae on the hymenium which suggests a variation towards the form of *L. mirabilis*.

ACIA Karsten.

1. Acia conferta sp. nov.

Illustrations: Plate 43, fig. 2.

Type: 28494, Rump (275), Town Bush, Maritzburg, Oct. 1934.

Effused, firmly adnate, subceraceous, sometimes crustose, with indeterminate margin. Spines crowded together, papillate to subulate, or fused in part at the base, fulvous to chestnut colour when dry, 0.3-1-(1.5) mm. in length. Subiculum very thin, creamy-fawn colour.

Basidia: hyaline, clavate, $16-28 \times 4-5\cdot 3 \mu$.

Spores: hyaline, elliptic, smooth, often unilaterally depressed, often uniguttulate, (3.5)-4-5.5- $(6) \times 2.5$ -4 μ .

Cystidioles: scanty, cylindric, hyaline, with rounded apex, 3 4 \times 40–46 μ .

Hyphae: of the subiculum, thin-walled, scanty, hyaline, without clamp connections, $2 \cdot 4 \mu$ diam.

Specimens examined: Type, cited above; van der Byl (308); Timber Research Lab. (9); Timber Research Lab. (14).

Differs from Acia subceracea Wakef. ! [in Trans. Proc. Roy. Soc. S. Australia 54 (1930) 155] in having larger spores, cystidioles with rounded apex, and usually longer hymenial spines; but otherwise in structure and appearance the two species are very close. (Cfr. Plate 43, fig. 1.) Except for their hydnoid structure these species are related in microscopic features to the Ceracea group of Corticium, especially to C. ochraceo-fulvum Bourd. and Galz. Acia fusco-atra (Fr.) Pat. is darker in colour and sometimes shows similar but much smaller cystidioles.

GRAMMOTHELE Berkeley and Curtis.

1. Grammothele pseudomappa sp. nov.

Illustrations: van der Byl in Ann. Univ. Stellenbosch 12 (1934) fig. 11 (as G. mappa B. and C.)

PLATE 44.

Type: 34963, Simpson and Talbot, Qudeni Forest, Zululand, Feb. 1945. Type in Herb. Kew; authentic material in Herb. Pretoriae.

Resupinate, adnate, effused. Margin determinate, about 0.5 mm. wide, light brown. Hymenium whitish to light buff colour, spread over tooth-like plates which are poroid at the base and capped with glistening granules. Surface with irregular anastomosing cracks. Context whitish, 0.5-1 mm. thick.

Basidia: $9-13 \times 2 \cdot 5$ 4 μ , cylindric or clavate, hyaline, very small, with two or four short straight sterigmata.

Spores: not seen with certainty; possibly broad elliptic or sub-globose, about $1\cdot 5~\mu$ diam. Cystidia: thin-walled, fusoid or cylindric, light yellow-brown, with homogeneous contents becoming hyaline when old, embedded in hymenium, seldom emergent, $4\cdot 6~(8)\times 26~36~\mu$. There seem to be similar cystidia embedded in strata especially towards the base of the trama, but they are colourless and very hard to see clearly.

Tissues: hyphae throughout are hyaline, very narrow, very much branched, very densely intertexed so that individual hyphae cannot be teased out. There are indications of strata showing that the fungus is perennial. In the latest hymenium the troughs of the pores are becoming filled with a network of young hyphae.

Minerals: large, often yellowish, irregularly shaped, in concretions up to 120 μ diam., scattered throughout the tissues and in the hymenium.

Specimens examined: (All as G. mappa in Herb. Pretoriae.) Type, 34963 (T.R.L. 2018), cited above; 31604, on Gymnosporia, Horseshoe, C.P., 11/8/1915; 11289, v. d. Byl, on Ilex mitis, Katberg Main Forest, 15/8/1915; 36434, Rump (766), Bulwer, Natal, Feb. 1947.

Macroscopically this species is very similar to G. mappa B. and C.! from Cuba, but the new species has not quite so coarse an appearance. The arrangement of the teeth and cracks in the two is identical, and a marked contrast to the poroid hymenium of G. cineracea Bres.!, and the linear striae of G. lineata B. and C.! and G. polygramma B. and C.!, which also differ microscopically.

The new species is distinguished from G. mappa by:—

- (1) Smaller basidia. (Basidia of G. mappa are $2.5-4 \times 16-19 \mu$);
- (2) The presence of coloured or hyaline cystidia embedded in the tissues;
- (3) The absence of erect sheaves of brownish hyphae capped by minerals. These embedded, or rarely emergent, structures are what Patouillard called "sterile cylindrical emergences" [Essai sur les Hym. (1900) 62, f. 44]. In G. pseudomappa they are represented merely by large mineral concretions lacking any hyphal base or core whatsoever. It should be added that Patouillard's fig. 44 is exceptionally misleading. For comparison PLATE 45, drawn from type material of G. mappa, is presented.

Lloyd [Myc. Writ. 5 (1916) 581] first cast doubt on the identity of the South African collections with G. mappa, mentioning the cystidia and the lack of "sterile emergences.' Van der Byl [in Ann. Univ. Stellenbosch 12 (1934) 8] describes as G. mappa specimens which are now referred to G. pseudomappa, while the collection cited by Simpson and Talbot [in S.A. Journ. Sci. (1946) 133] as G. mappa becomes the type of the new species. G. mappa is apparently not a South African species.

It may be noted that Lloyd [Myc. Writ. 7 (1923) 1214], in an article headed "Miscellaneous Notes in Cesati's Herbarium", states: "Grammothele mappa is Poria Ravenelae." The former is certainly not synonymous with P. Ravenalae B. and Br. !. Possibly this reference is simply a correction of the determination in Cesati's Herbarium.

GRANDINIA Fries.

1. **Grandinia bicolor** Talbot apud Wakefield and Talbot in Bothalia 4 (1948) 947, fig. 6. *Type*: 27756, Rump (100), Town Bush, Maritzburg; In Herb. Kew, with isotype in Herb. Pretoriae.

Resupinate, effused, cracking but little on drying, separable from the substratum. Margin lifting slightly on drying, determinate, light brown, pubescent. Hymenium pallid, with a pale greenish-yellow, glaucous, tint. Context Prout's brown colour. Spines densely crowded, hemispherical or pointed.

Basidia: hyaline, cylindric-clavate, $14-17 \times 4-5 \mu$.

Spores: hyaline, smooth, elliptic-cylindric, usually with one side flattened, 7-8.5 (10) $\times 2.8-3.5 \mu$.

Hyphae: dark brown, moderately thick-walled, 3 μ wide, densely packed adjacent to the substratum, extending in a looser horizontal network in the mid-trama and sweeping up in numerous vertical branches into the hymenium. Occasionally

several hyphae aggregate into a thick cord in the trama. Between these conspicuous hyphae is a system of branched, nearly hyaline, filamentous hyphae sometimes seen protruding as branched paraphyses (? dendrophyses) from the apex of the spines.

Minerals: present as crystals or granules.

Specimens examined: Type, cited above; 28502, *Rump* (270); 28291 *Rump* (215); 28292, *Rump* (217); all from type locality, Aug. and Oct. 1934.

A most distinctive species differing from all known species of *Grandinia* in the colour contrast of hymenial and abhymenial surfaces, and in the hyphal systems.

GRANDINIA SPECIES RECORDED FROM SOUTH AFRICA BUT NOT AVAILABLE FOR STUDY: rosea P. Henn.; Van der Byl in Ann. Univ. Stellenbosch 12 (1934) 8.

ODONTIA Persoon ex S. F. Gray.

Odontia arguta (Fr.) Quélet, Flor. Myc. de Fr. (1888) 435; Bresadola, Fung. Kmet. (1897) n. 114; Bourdot and Galzin, Hym. de Fr. (1928) 427; Rea, Brit. Basid. (1922) 648; Wakefield in Trans. Roy. Soc. S. Australia 54 (1930) 157; van der Byl in Ann. Univ. Stellenbosch 12 (1934) 8.

Hydnum argutum Fries, Syst. Myc. 1 (1821) 414, Hym. Eur. (1874) 616.

Hydnum stipitatum Fr. sensu Romell (fide Bourd. and Galz.).

Illustrations: Bourdot and Galzin (1928) l.c., f. 114.

PLATE 46.

Effused, resupinate, rather adnate, dry. Margin indeterminate, whitish. Hymenium creamy to ochraceous, with granuliform or subulate spines up to 1 mm. long, usually much shorter, discrete or basally united, penicillate at the apex. Context floccose, with a little mineral content.

Basidia: roughly clavate, $3-5 \times 13-20 \mu$, with four sterigmata.

Spores: hyaline, broadly ovate, smooth, often uniguttulate, 3-4 \times 5 μ .

Cystidia: small, subulate, with a capitate encrusted apex, the capitate part $8 \times 2.5 \cdot 3.5 \mu$; or cylindrical with rounded apex and crowned with a yellowish resinous globule; cystidia borne apically or laterally on the spines.

Hyphae: hyaline, with many clamp connections, 2-(4) μ diam.

Specimens examined: 28883, Bottomley, The Cavern, Drakensberg, Natal, 20 7/1937; 28313, Doidge and Morgan, nr. Donnybrook, Natal, Feb. 1935; Acock (v. d. Byl, 2638), Stickland, Feb. 1933; van der Byl (2726), South Africa, Oct. 1933.

Of the specimens cited above, No. 28883 has both spathulate and globular cystidia. The two collections of van der Byl have resinous globules but no spathulate cystidia, and in this they correspond with the Australian forms described by Miss Wakefield (1930, l.c.). On occasions only spathulate cystidia may be found.

2. Odontia knysnana van der Byl! in Ann. Univ. Stellenbosch 12 (1934) 9.

Illustrations: PLATE 47.

Resupinate, adnate, confluent, white, later creamy, with byssoid margin. Context thin, effused. Teeth minute, discrete though close together, 6-8 per mm., granuloid, microscopically ciliate at the apex.

Basidia: clavate-cylindric, $4 \times 23 \mu$.

Spores: hyaline, smooth, elliptical, often with one side flattened, apiculate towards the side, $2 \cdot 5 - 3 \times 5 \mu$.

- Cystidia: mostly at the apex of the spines, fine pointed, about 35 \times 3-4 μ , encrusted with crystals readily soluble in KOH, hyaline.
- Hyphae: thin-walled, 3-4 μ diam., with clamp connections, much branched, densely and suberectly interwoven, encrusted with granules, becoming smooth in KOH after some time.
 - Specimens examined: Type, v. d. Byl (1332), Knysna, Jan. 1924. (Part of Type in Herb. Kew.)

This species is not far removed from *Odontia crustosa* (Pers.) Quélet. The latter, however, has non-encrusted cystidia and hyphae. Its hyphae have only rare clamps and appear to collapse more readily than those of *O. knysnana*. As there is only one collection of *O. knysnana* in existence, it is not possible to assess whether it is a "good" species or not.

HYDNUM Linn, ex Fries.

- RESUPINATE HYDNUM SPECIES RECORDED FOR SOUTH AFRICA BUT NOT AVAILABLE FOR STUDY.
 - ambiguum B. and Br.; Kalchbrenner in Grev. 10 (1881) 57, from Kaffraria.
 - mucidum Fr.; Kalchbrenner in Grev. 10 (1881) 57, from Somerset East; Saccardo, Syll. Fung. 6 (1888) 471.
 - sclerodontium Mont. & Berk.; in Litt. Timber Research Lab. (165), from Rand gold mines.
- SYNONYMS AND EXCLUDED SPECIES IN HYDNUM.
 - ochraceum Pers. ex Fries—Mycoleptodon ochraceum (Pers. ex Fr.) Pat. The Medley Wood (479) collection referred to as H. ochraceum in Grev. 10 (1881) 27 and S.A. Journ. Sci. 13 (1917) 440 lacks cystidia and is some other species of Hydnum.
 - pudorinum Fries. [Recorded in Grev. 10 (1881) 57.] = Mycoleptodon ochraceum (Pers. ex Fr.) Pat. q.v.

RADULUM Fries.

SPECIES RECORDED FOR SOUTH AFRICA BUT NOT AVAILABLE FOR STUDY:

javanicum (P. Henn.) Lloyd.; Lloyd, Myc. Writ. 6 (1920) 952.

orbiculare Fries; Kalchbrenner in Grev. 10 (1881) 57, from Somerset East.

SYNONYMY AND EXCLUDED SPECIES IN RADULUM:

javanicum (P. Henn.) Lloyd=Lopharia javanica P. Henn.

mirabile B. and Br. ! = Lopharia mirabilis (B. and Br.) Pat. q.v.

THELEPHORA Ehrhart ex Fries.

- NOTES ON RECORDS OF RESUPINATE SPECIES OF THELEPHORA FROM SOUTH AFRICA:
 - acerina Pers.; Lévéille in Ann. Sci. Nat. ser. 3, 5 (1846) 150 Aleurodiscus acerinus (Pers.) Höhnel and Litschauer, or its variety longisporus Höhnel and Litschauer. q.v.
 - biennis Fries; Kalchbrenner in Grev. 10 (1881) 58. The MacOwan collections of this in S.A. Museum are *Stereum bicolor* fide v. d. Byl in Ann. Univ. Stellenbosch 7 (1929) 42.
 - fusco-violascens Mont.; Montagne in Ann. Sci. Nat. ser. 3, 7 (1847) 174. = Hymenochaete fuscoviolascens (Mont.) Sacc. fide v. d. Byl (1929) 1.c. Pg. 14.

pedicellata Schwein.; Bottomley in S.A. Journ. Sci. 13 (1917) 440, refers to a collection Medley Wood No. 532. This collection is a species of Septobasidium.

punicea Alb. and Schwein.; Kalchbrenner in Grev. 10 (1881) 58 = Tomentella punicea (Alb. and Schwein.).

TOMENTELLA Patouillard.

TOMENTELLA SPECIES RECORDED FOR SOUTH AFRICA BUT NOT AVAILABLE FOR STUDY:

Eylesii (van der Byl); v. d. Byl in S.A. Journ. Sci. 22 (1925) 168, in Ann. Univ. Stellenbosch 7 (1929) 18, as *Hypochnus Eylesii*.

puniceus (Alb. and Schwein.); v. d. Byl (1929) l.c. Pg. 19, as *Hypochnus*; Kalchbrenner in Grev. 10 (1881) 58, as *Thelephora*; Wood in Rept. Natal Bot. Gard. (1898) 19, as *Thelephora*.

THELEPORA Fries.

1. Thelepora cretacea Fries! in Hornsch. Skand. Beitr. Naturgesch. 2 (1847) 333, in Bot. Zeit. 6 (1848) 340.

Theleporus cretaceus Fries (orthographic variant) in Actis Acad. Scient. Holm. (1848) 138, in Summ. Veg. Scand. 2 (1849) 235; Saccardo, Syll. Fung. 6 (1888) 421; Lloyd, Myc. Writ. 3 (1910) 479, fig. 374.

Illustrations: Lloyd (1910) l.c., f. 374.

Plate 48.

Resupinate, effused, light creamy yellow colour in herbarium, closely adnate. Hymenium poroid. Pores shallow, angular, fairly regular, about 3-4 per mm., with thin dissepiments, each pore with a small basidia-bearing papilla in the centre which originates in the same manner as the pore walls.

Basidia: not reviving properly on mounting treatment but thought to be irregularly clavate, about $18 \times 3.5 \mu$.

Spores: none seen attached. A few spores seen, globose, hyaline, rather thick-walled, 3.5μ diam., but it is doubtful whether these really belong.

Hyphae: thick-walled, 4 μ wide, in a close horizontal network below the pore layer.

Specimens examined: Part of the Friesian Type in Herb. Kew, collected by Wahlberg in Natal.

The genus *Thelepora* is closely allied to *Poria* and may prove to be merely a freak *Poria*. *Thelepora cretacea* comes very near to *Poria versipora* (Pers.) Fr. in structure. Fries writes of the papillae in the pores thus: "This definite formation is not only peculiar and remarkable, but also serves to distinguish it from *Porothelium*." There is not in fact much resemblance to a *Porothelium*.

One other species of *Thelepora* has been described. This is *T. griseus* Rick [in Broteria 5 (1906) 15; Saccardo, Syll. Fung. 21 (1912) 361], a Brazilian species of greyish colour, with round or polygonal, coloured spores, 3 6 μ diam. The writer has not seen any material of this species.

LATIN DIAGNOSES OF NEW SPECIES.

Peniophora pelliculosa sp. nov.

Fungus resupinatus, late effusus, crassus, molliter pelliculosus, udus separabilis. Color hymenii plus minus roseobubalinus vel stramineus. Subiculum candidum, floccosum, 550-1,000 μ crassum. Basidia cylindraceo-clavata, dense fasciculata, 5-6 \times 16-23 μ (immatura). Sporae oblongae vel ellipsoideae, laeves, hyalinae, 3-3·3 \times 5-7 μ . Cystidia in strato superiore 70-100 μ crasso immersa, raro usque 12 μ emergentia, dense incrustata vel capitatim incrustata, tenuiter tunicata, interdum apice

incrassata, clavato-cylindracea, $20-36-(50) \times (8)-10-13~\mu$. Hyphae hymeniales et subhymeniales non distinctae; hyphae subiculi distinctissimae, ramosae laxe intertextae, septatae, basales $3\cdot 5-5-6~\mu$ crassae, subhymenio interdum granulis incrustato.

Hab. ad lignum, Krantzkop, Natal.

Coniophora fodinarum sp. nov.

Fungus resupinatus, late effusus, facile separabilis, siccitate fragilis haud rimosus, ad 2 mm. crassus. Hymenium tuberculosum, olivaceo-umbrinum vel umbrinum. Superficies superior mollis, velutina, fusca. Contextus pallidus. Interdum fila rhizoidea adsunt. Basidia non visa nisi collapsa. Sporae magnitudine variae, $5-6-6\cdot6 \times 6\cdot6-7\cdot5-8\cdot3-10~\mu$, subglobosae vel plerumque ellipsoideae, saepe uno latere plano, coloratae, laeves, liberatae vel inter hyphas hyalinas ramosas filamentas in strato ad 260 μ crasso immersae. Hyphae (1) strati sporogenosi hyalinae, ramosae, ad 1 μ diam. (2) strati intermedii (500-660 μ crassi) pallide coloratae, 2 μ diam., dense intertextae (3) superiores tenuiter tunicatae, 3-(6) μ diam., fuscae, stratum fuscum spongiosum circiter 250 μ crassum efformantes.

Hab. ad lignum in fodinis Transvaaliae.

Acia conferta sp. nov.

Fungus effusus, arcte adnatus, subcereus interdum crustaceus margine indeterminato. Aculei conferti, papillosi vel subulati vel ex parte basi coalescentes, fulvescentes vel castanei, 0.3-1-1.5 mm. longi. Basidia clavata, hyalina, $16-28\times4-5.3$ μ . Sporae laeves, ellipticae, hyalinae, saepe uno latere depressae, interdum uniguttulatae, $(3.5)-4-5.5-(6)\times2.5-4$ μ . Cystidiola sparsa, cylindrica, hyalina, apicibus rotundatis, $3-4\times40-46$ μ . Hyphae basales tenuiter tunicatae, sparsae, hyalinae, haud nodosae, 2-4 μ diametro.

Hab. ad lignum: Pietermaritzburg, Natal.

Grammothele pseudomappa sp. nov.

Fungus resupinatus, effusus. Margo definitus, circiter 0.5 mm. latus, pallidebrunneus. Hymenium sordide album vel bubalinum, dentibus vel lamellis curtis confertis, basi porosum, apice corrusco-granulosum. Contextus sordide albus, 0.5-1 mm. crassus. Basidia $9-13\times2.5$ 4 μ , cylindrica vel clavata, hyalina; sterigmatibus 2-4, rectis. Sporae non certe visae; late ellipsoideae subglobosae, circiter 1.5 μ diam. Cystidia fusoidea vel cylindrica, tenuiter tunicata, pallide flavobrunnea, senectute hyalina, immersa, raro emergentia, $4.6-(8)\times26$ 36 μ . Hyphae hyalinae, ramosissimae, tenuissimae, dense intertextae. Crystalla magna, saepe flavida, irregulariter formata, usque ad 120 μ diam., in trama et hymenio immersa.

Hab. ad lignum: Qudeni, Zululand.

EXPLANATION OF THE PLATES.

The illustrations were drawn with the aid of a Reichert drawing apparatus. In general, a transverse section through the body of the fungus is shown, and in addition there are separate drawings of various individual organs at a higher magnification. The magnifications are indicated by linear scales on the plates, the smaller scale, when present, invariably referring only to the sectional drawing.

A broken line running horizontally across a sectional drawing indicates that the full width of the section has not been included. The following scheme of lettering has been used throughout the illustrations:—

B =basidia. V =conducting vessels.

S = spores. E = setae.

C =cystidia or cystidioles. FE =false setae.

G =gloeocystidia. AE =asterosetae H =hyphae. M =mineral inclusions. D = view in transverse section. =oil globules. SH = hairs of the abhymenial surface. X =substratum tissue. INDEX TO GENERA AND SPECIES. Corticium, 5, 12. abeuns, 13, 19. acerinum, 28. Acia, 5, 59. conferta, 59, 63, Pl. 43. fusco-atra, 59. subceracea, 59, Pl. 43. alliaceum, 26. armeniacum, 12, 16, 19, Pl. 8. Aleurodiscus, 5, 26. acerinus, 19, 27, 28, 62. aschistum, 40. atrocinereum, 19, 44. acerinus var. alliaceus, 26, 27. aurora, 18. Berkeleyi, 21. acerinus var. longisporus, 19, 26, 27, 28, 62, Pl. 18. bombycinum, 19. cerussatus, 28. brunneolum, 35. cacaoicolor, 17. caeruleum, 12, 15, Pl. 7. calceum, 19, 27, 28. disciformis, 28. Aspergillus, 39. Asterostroma, 5, 54. centrifugum, 15 albido-carneum, 54. ceraceum, 16, 19 cervicolor, 54, 55, Pl. 39. corticola, 54. pallidum, 54. cervicolor, 54. cinereum, 19, 24. confluens, 13, 18, 19, Pl .11. confluens var. subcalceum, 18. Asterostromella, 5, 51, 54. dura, 51, 53, Pl. 37. duriuscula, 19, 45, 51, 54, Pl. 36. Rumpiana, 53, 54, Pl. 38. diminuens, 52. Dregeanum, 19, 57, 58. Ellisii, 35. ephebium, 41. Auricularia, 5, 6, 29. Butleri, 29. filamentosum, 23. giganteum, 24. gloeosporum, 12, 14, 15, Pl. 6, grammicum, 52, hinnuleum, 54, javanicum, 17, lacteum, 10 corrugata, 6. mesenterica, 6, Pl. 1. mesenterica var. lobata, 6. papyrina, 30. phosphorea, 15. lacteum, 19. reflexa, 28. laetum, 18. rugosissima, 28. sordescens, 29. laeve, 14, 15. latitans, 21. strigoso-zonata, 28. leucothrix, 35. tremelloides, 6. luteocystidiatum, 12, 13. mauritianum, 16. Boletus purpurascens, 30. molle, 16, 58. Mollerianum, 22 Byssus phosphorea, 15. myxosporum, 21. nudum, 19, 25. Ceriomyces venulosus, 25. Cladoderris Pritzelii, 57. ochraceo-fulvum, 59. Coniophora, 5, 33, 36. arida, 36. ochrofarctum, 13. olivaceum, 35. pallidum, 12, 13, 14, Pl. 5. pelliculare, 19. atrocinerea, 35, 36. Betulae, 36, 37. brunneola, 35. cerebella, 36. Petersii, 23. portentosum, 19, 51, 52, 53. Ellisii, 35. radicatum, 23 Ellisti, 35. fodinarum, 34, 36, 64, Pl. 23, Fig. 2. fumosa, 34, 35, 36. leucothrix, 35. olivacea, 34, 35, 36, Pl. 24. papillosa, 33, Pl. 23, Fig. 1. puteana, 34, 36. elictotremoides, 34 roseo-cremeum, 21. roseolum, 18. roseum, 18. Roumeguerii, 22. salmonicolor, 13, 17, 18, Pl. 10, scutellare, 12, 16, Pl. 9. sistotremoides, 34. seriale, 13. sordulenta, 53, Pl. 37. suffocata, 37. tristiculum, 46. tuberculosum, 25. Coniophorella, 36. atrocinerea, 35, 36. olivacea, 35, 36. tumulosum, 12, 17.

vagum, 19. Zimmermanni, 17.

Cytidia flocculenta, 15.	corrugata, 48.
Dichostereum, 53.	crassa, 42.
Duportella, 5, 43, 46, 50.	Dregeana, 57, 59. Ellisii, 35.
tristicula, 45, 46, 47, 58, Pl. 31, Pl. 32.	fasciculata, 48, 49, Pl. 33.
tristiuscula, 46.	fuliginosa, 48, 49.
velutina, 46.	fuscoviolascens, 50, 62.
"Erineum" gall., 12, Pl. 4.	griseocervina, 43. Kalchbrenneri, 42.
Exobasidium, 5, 11.	lictor, 49.
Andromedae, 11. Arctostaphyli, 11.	luteobadia, 45, 50.
Azaleae, 11.	multispinulosa, 42.
• cassandrae, 11.	nigricans, 45. ochromarginata, 48, 49, 50, Pl. 35.
discoideum, 11.	olivaceum, 43.
Giseckiae, 11, Pl. 3, Fig. 2, Karstenii, 11.	purpurea, 42.
Myrtilli, 11.	rigidula, 50.
oxycocci, 11.	rubiginosa, 45, 50. scabriseta, 42.
Peckii, 11. Rhododendri, 11.	semistupposa, 48, 49, Pl. 34.
Vaccinii, 11, Pl. 3, Fig. 1.	tabacina, 50.
Vaccinii-Myrtilli, 11.	tenuissima, 50. tristicula, 46, 47, 50.
Fomes, 55.	tristiuscula, 46.
Fusidium Vaccinii, 11.	umbrina, 42.
Gloeocystidium.	vinosa, 42.
argillaceum, 13, 14.	Hypochnus.
pallidum, 13	acerinus, 28. Bagliettoanus, 9.
pallidum subsp. argillaceum, 13.	Eylesii, 63.
Grandinia, 5, 60.	olivaceus, 35.
bicolor, 60. rosea, 61.	pallescens, 53, Pl. 37.
Grammothele, 5, 59.	puniceus, 63. purpureus, 8.
cineracea, 60.	thelephoroides, 53.
liniata, 60.	Irpex, 11.
mappa, 59, 60, Pl. 45. polygramma, 60.	Kneiffia.
pseudomappa, 59, 60, 63, Pl. 44.	purpurea, 42.
Gyrophana himantioides, 31.	Roumeguerii, 22. setigera, 21.
Helicobasidium, 5, 7.	Leptodon ochraceum, 55.
compactum, 7, Pl, 2.	
longisporum, 7, 8. mompa, 8.	Licentia yao-chanica, 56, 57.
mompa forma macrosporum, 7.	Lloydella, 57. Beyrichii, 40.
purpureum, 8.	bicolor, 39.
purpureum var. orientale, 7.	cinerascens, 40.
Helicobasis purpureus, 8.	occidentalis, 41. scabriseta, 42.
Helvella mesenterica, 6.	Schomburgkii var. brunnea, 43.
Heterochaete andina, 10.	Lopharia, 5, 56.
Hydnum, 5.	Dregeana, 19, 47, 57, 58, Pl. 42,
alnicolum, 55. ambiguum, 62.	javanica, 57, 58, 62.
argutum, 61.	lirellosa, 56, 57. mirabilis, 41, 56, 57, 58, 59, 62, Pl. 41.
Daviesii, 55.	Merulius, 5, 29.
microdon, 55. mucidum, 62.	confluens, 30, 31, 33.
ochraceum, 55, 56, 62.	corium, 29, 30, 31, 33, Pl. 20. gelatinosus 29, 32, 33, Pl. 22. himantioides, 29, 31, 32, 33, Pl. 21.
pudorinum, 55, 62.	himantioides. 29, 31, 32, 33, Pl. 21.
sclerodontium, 62.	lacrymans, 32, 33, Pl. 21.
stipitatum, 61.	papyrinus, 30.
Hymenochaete, 5, 43, 48. bonariensis, 41.	serpens, 33. squalidus, 31, 32, 33.
castanea, 46, 47.	strigoso-zonatus, 28.
cervina, 49.	tenuis, 31.

Mycinema phosphoreum, 15.	Punctularia, 5, 25.
Mycoleptodon ochraceum, 55, 62, Pl. 40.	affinis, 25, Pl. 17. atropurpurascens, 25, 26.
Necator decretus, 17, 18.	tuberculosa, 25, 26.
Odontia, 5, 61. arguta, 61, Pl. 46. crustosa, 62. knysnana, 61, 62, Pl. 47. setigera, 21.	Radulum, 5, 57, 62. javanicum, 62. membranaceum, 19. mirabile, 56, 62. orbiculare, 62.
Peniophora, 5, 20. arenata, 20, 22. argillacea, 13, 14. aspera, 20, 21, 36, Pl. 13. atrocinerea, 43, 44. Berkeleyi, 40. byssoidea, 21. carneola, 13. cinerascens, 40. cinerea, 19, 24, 25, 42. cremea, 20, 25. dissita, 41. ephebia, 41. filamentosa, 20, 23, 24, Pl. 15. gigantea, 20, 23, 24, Pl. 16. glebulosa, 25. intermedia, 42, laevigata, 47. leprosa, 22. moricola, 40. neglecta, 41. nuda, 19, 25. occidentalis, 41. pallidula, 21. pelliculosa, 20, 25, 63, Pl. 12. pubera, 23. radicata, 23. Roumeguerii, 20, 22, 23, 41, Pl. 14.	Reticularia affinis, 25, 26. atropurpurascens, 25. atrorufa, 25, 26. pyrrhocreas, 26. venulosa, 25, 26. Rhizoctonia, 8. crocorum, 8. medicaginis, 8. violacea, 8. Sclerotium crocorum, 8. Sebacina, 5. africana, 10. epigaea, 10. Septobasidium, 5, 8, 63. Bagliettoanum, 9, 10. bogoriense, 9, 10. carestianum var. natalense, 9, 10. compactum, 7. Curtisii, 9, 10. grandispinosum, 9, 10. griseopurpureum, 9. mompa, 7, 10. natalense, 9. philippinense, 9, 10. protractum, 9. pseudopedicellatum, 9. Schweinitzii, 9. Steccherinum ochraceum, 55.
Schweinitzii, 40. setigera, 21. stratosa, 22. subiculosa, 20. tomentella, 21. unicolor, 23.	Stereum, 5, 37. acerinum, 28. acerinum var. longisporum, 26 adnatum, 38, 39, 45. albobadium, 45. albocinctum, 52, 53, Pl. 37.
Phlebia, 5, 28, 29. mesenterica, 6.	atrocinereum, 43, 44, 45. balsameum, 37.
hispidula, 29. pileata, 28. reflexa, 28. rubiginosa, 28. rugosissima, 28. strigoso-zonata, 28, Pl. 19. zonata, 28.	balsameum f. reflexum, 37, bicolor, 37, 39, 40, 45, 62, Pl. 26, cinerascens, 37, 40, 41, 57, 58, 59, Pl. 27 coffeatum, 39, crassum, 42, crispum, 37, dissitum, 41, duriusculum, 45, 51, 52, 53.
Polyporus nidulans 24. purpurascens, 30. rutilans, 24.	elegans, 45, 50, fasciatum, 45, 50, fuscum, 39, 45, induratum, 52, 53, Pl. 37.
Polystictus tabacinus, 50.	laxum, 45.
Poria, 11, 57, 63. Ravenalae, 60. versipora, 63.	lugubris, 29. luteobadium, 45. membranaceum, 43, 44, 45. moricolum, 40.
Porothelium, 63.	neglectum, 41.
Ptychogaster, 26.	pannosum, 39, 40. papyrinum, 43.

percome, 45, 47. pruinatum, 45. purpurascens, 41. retirugum, 43. rigens, 38. rimosum, 39, 45. rimosum var. africanum, 37, 38, 39, 45. Tiniosum var. atricalium, 37, 36, 39, 43. rubiginosum, 45, 50. sanguinolentum, 37, 38, Pl. 25. Schomburgkii, 19, 37, 40, 43, 44, 45, 47, 58, Pl. 29, Pl. 30. Thozetii, 45. umbrinum, 25, 37, 41, 43, 47, Pl. 28. Stypinella purpurea, 8.

Thanatophyton crocorum, 8.

Thelephora, 5, 62. acerina, 27, 28, 62. albido-carnea, 54. atro-coerulea, 15. atropurpurascens, 25. Beyrichii, 40. bicolor, 39. biennis, 62. caerulea, 15. cinerascens, 40. confluens, 18. corium, 30. crassa, 42. fimbriata, 15. fusca, 39, 40. fuscoviolascens, 62.

gigantea, 24. hirsuta B, 37. incarnata var. B, 30, indigo, 15. insinuans, 53. mesenterica, 6. olivacea, 36. pallescens, 53. pannosa, 39. pedicellata, 63. pergamenea, 24. punicea, 63. sanguinolenta, 37. sericea B, 37. vinosa, 39.

Thelepora cretacea, 63, Pl. 48.

Theleporus cretaceus, 63. griseus, 63.

Thwaitesiella mirabilis, 56.

Tomentella, 5 Eylesii, 63. punicea, 63.

Tremella epigaea, 10.

Trichosporium Curtisii, 25.

Tuber croci, 8.

Vararia, 54. pallescens, 53.

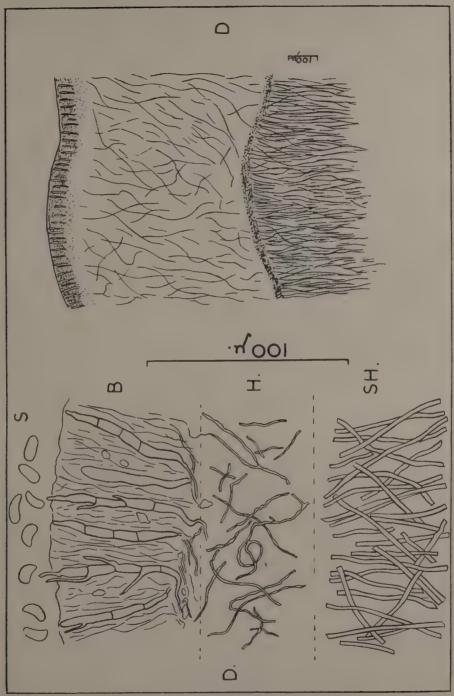


PLATE 1.

Auricularia mesenterica (Dicks ex Fr.) Fr.

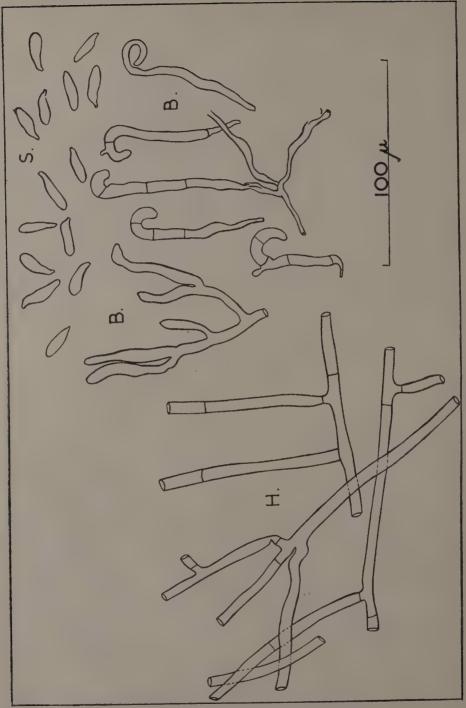


PLATE 2.

Helicobasidium compactum (Boedijn) Boedijn.

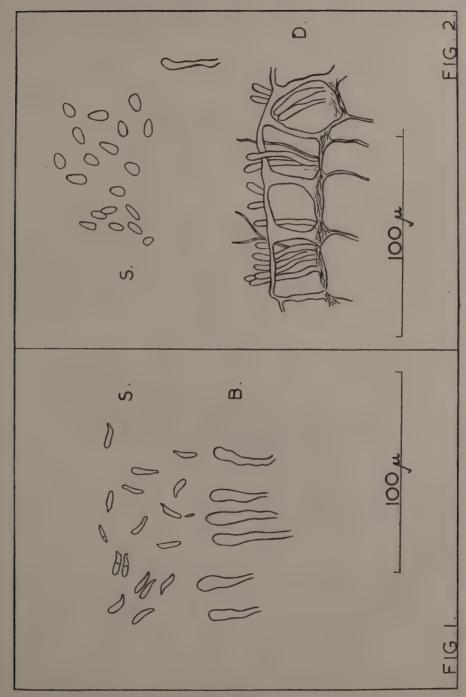


PLATE 3.
FIG. 1.—Exobasidiumvacciniic (Fuckel) Woronin.
FIG. 2.—Exobasidium Gisekiae nAllescher.

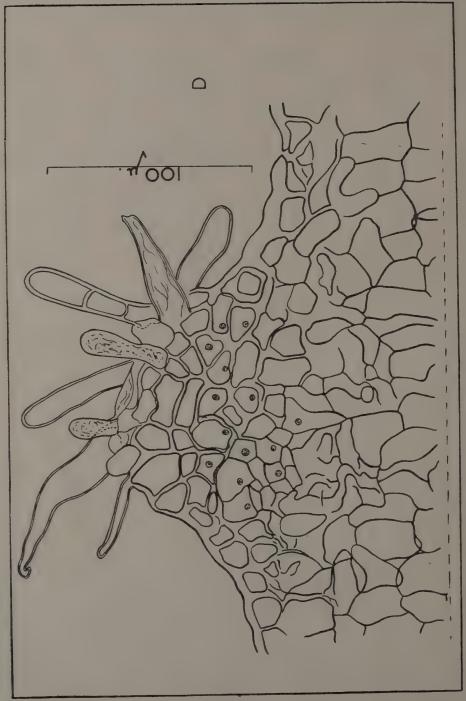


PLATE 4.

Transverse section of an "Erineum" gall on the leaf of Gymnosporia buxifolia.

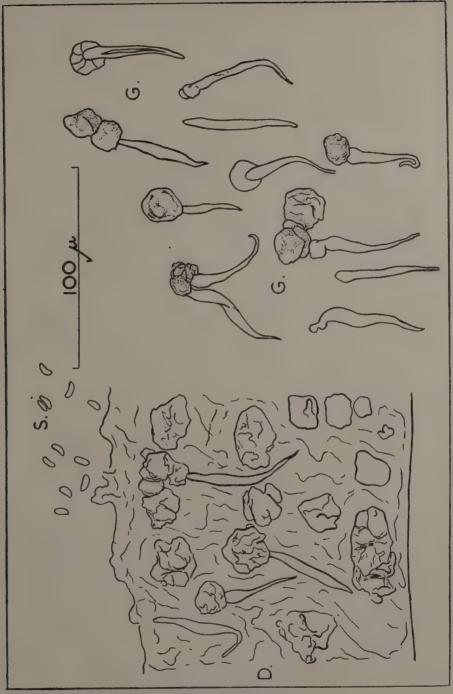


PLATE 5.

Corticium pallidum Bres.

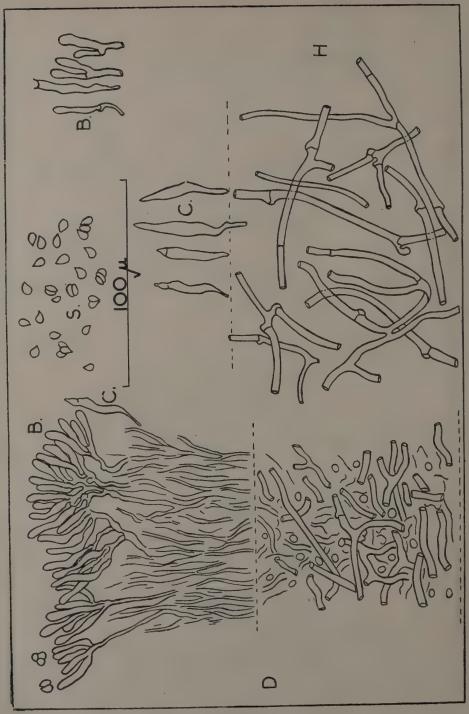


PLATE 6.
Corticium gloeosporum Talbot.

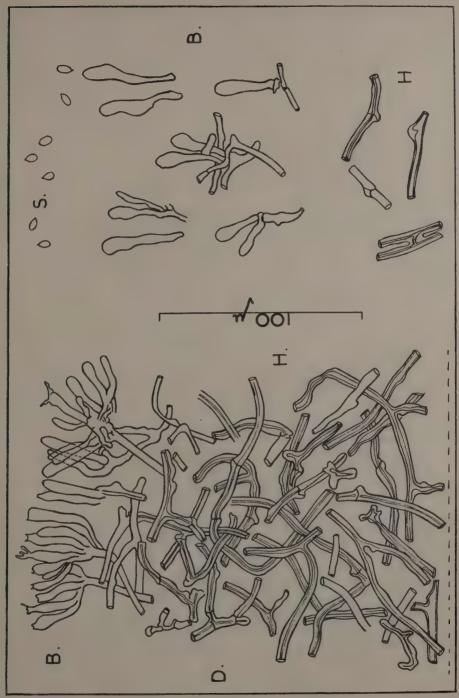


PLATE 7.
Corticium caeruleum (Schrad. ex. Fr.) Fr.

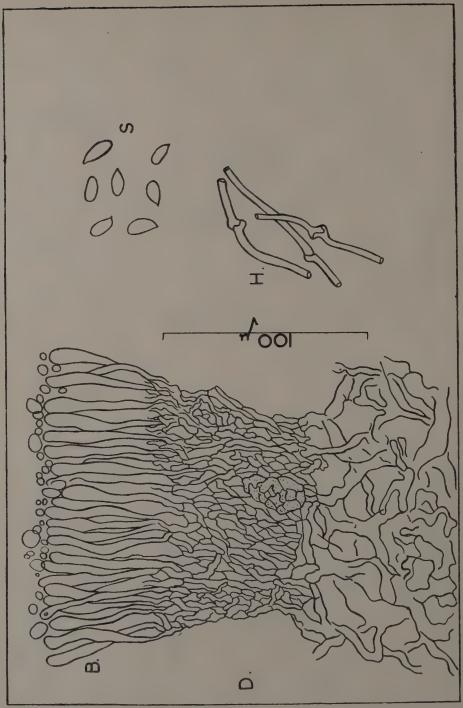


PLATE 8.

Corticium armeniacum Sacc.

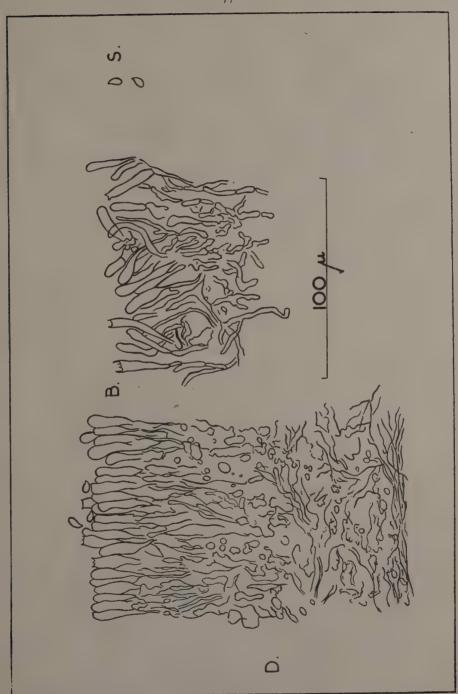


PLATE 9.

Corticium scutellare B. & C.

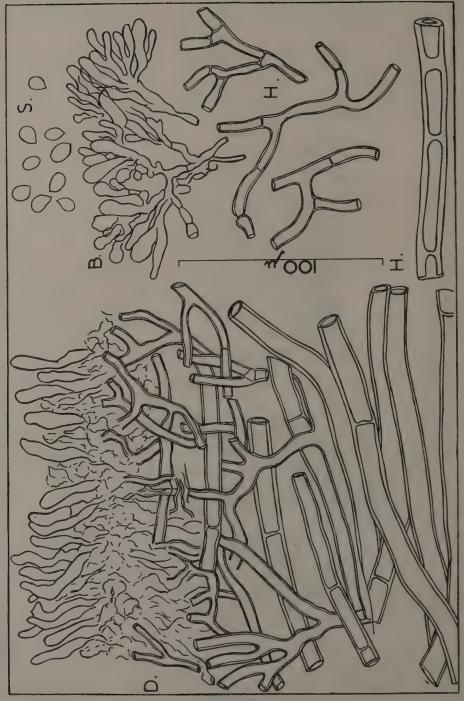


PLATE 10.

Corticium salmonicolor B. & Br.

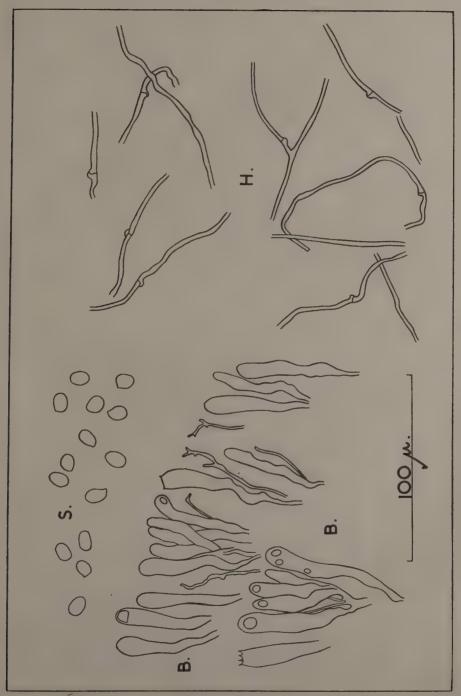


PLATE 11.
Corticium confluens (Fr.) Fr.

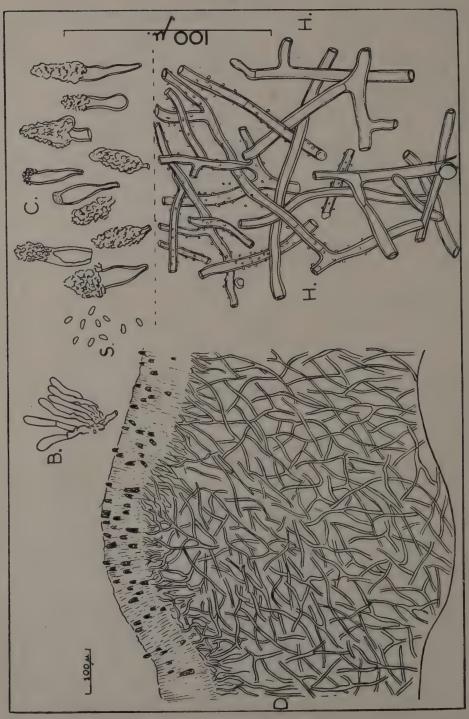


PLATE 12.

Peniophora pelliculosa sp. nov.

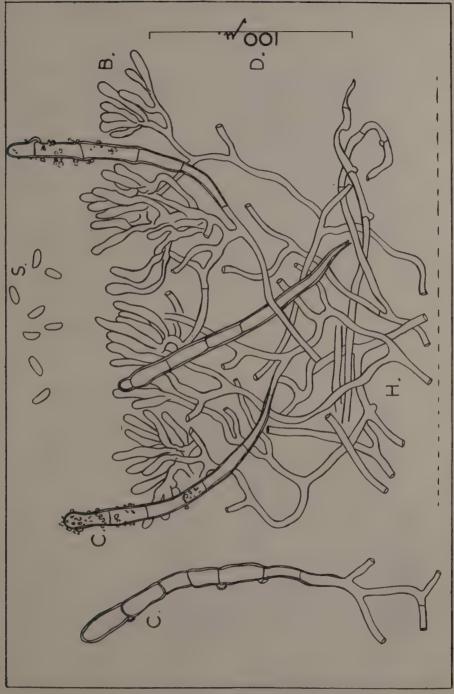


PLATE 13.

Peniophora aspera (Pers.) Sacc.

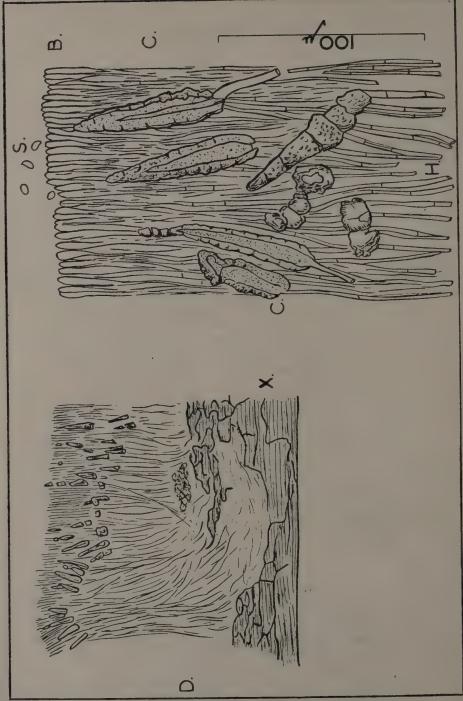


PLATE 14.

Peniophora Roumeguerii (Bres.) Burt.

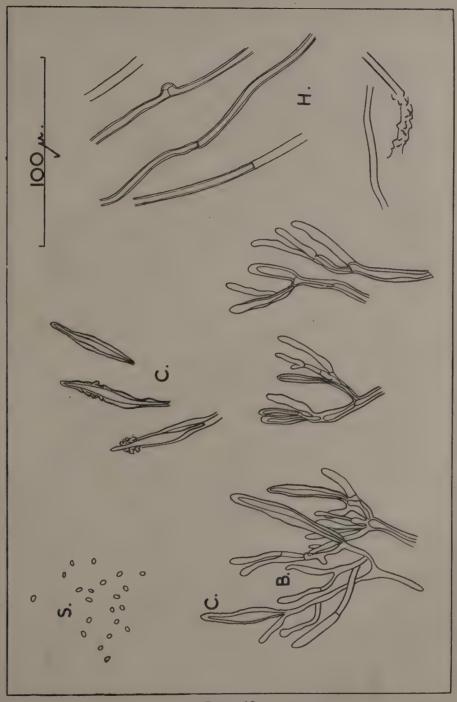


PLATE 15.
Peniophora filamentosa (B. & C.) Burt.

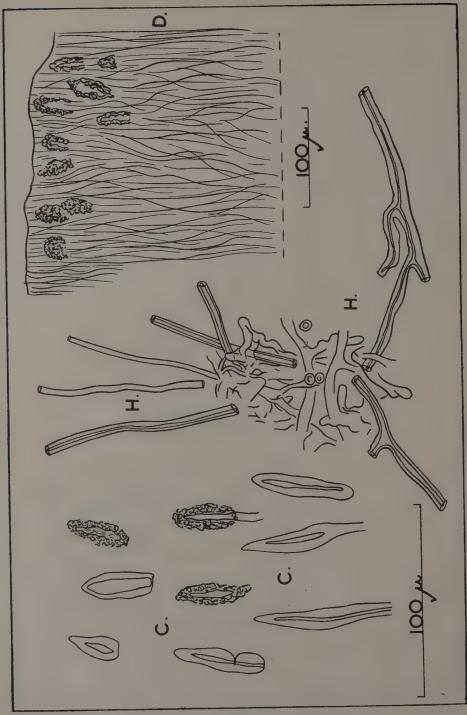


PLATE 16.
Peniophora gigantea (Fries.) Massee.

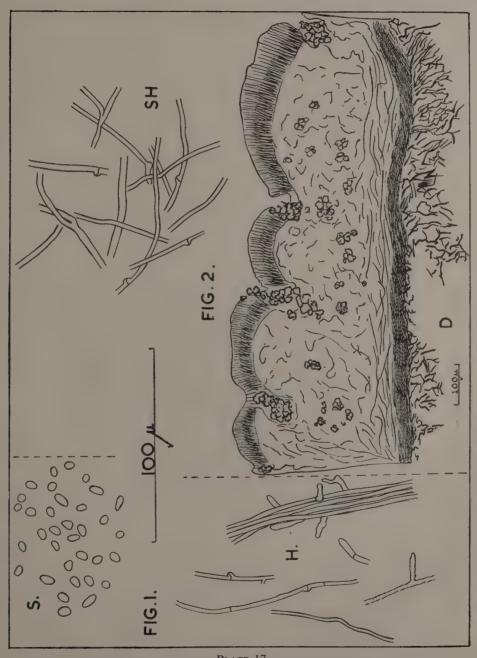


PLATE 17.
FIG. 1.—Punctularia affinis (B. & C.) comb. nov. conidial stage.
FIG. 2.—Punctularia affinis (B. & C.) comb. nov.

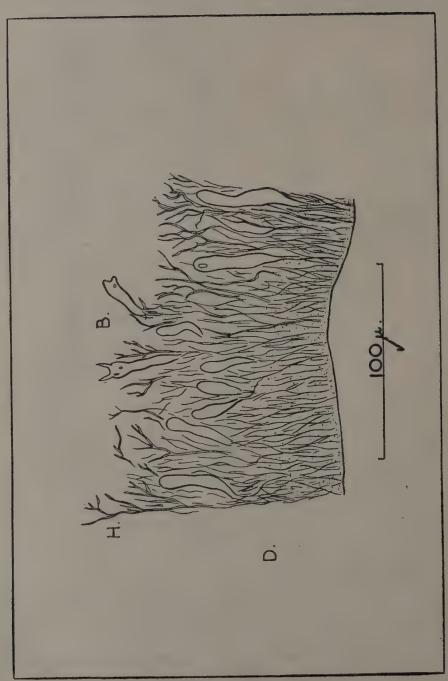


PLATE 18.

Aleurodiscus acerinus var. longisporus Höhnel & Litsch.

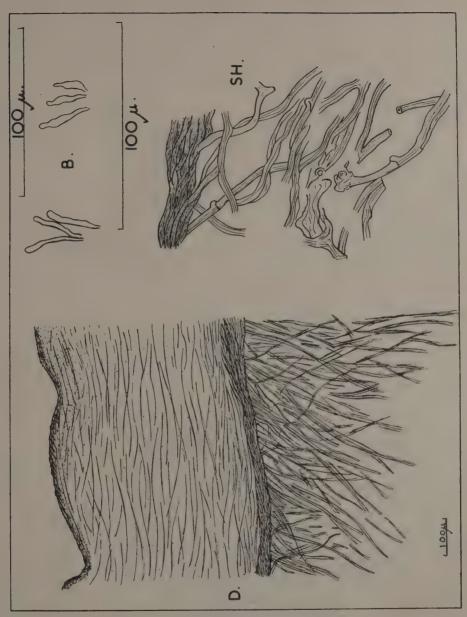


PLATE 19.

Phlebia strigoso-zonata (Schwein.) Lloyd.

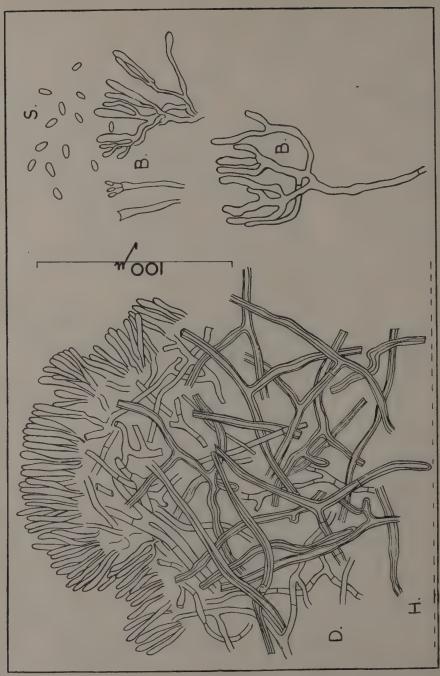


PLATE 20.

Merulius corium (Pers. ex Fr.)Fr.

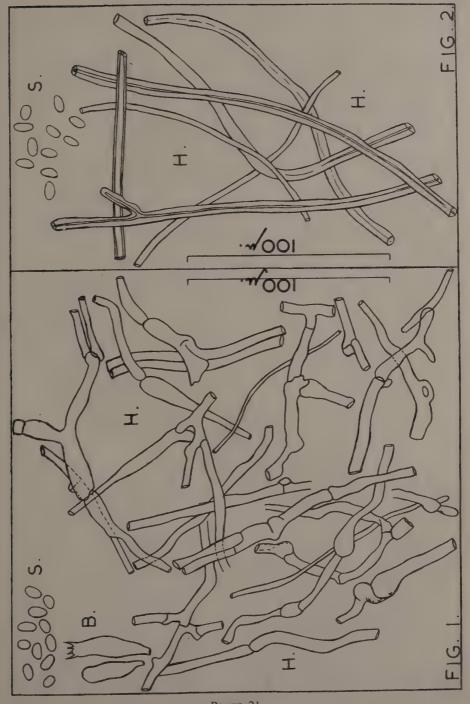


PLATE 21. FIG. 1.—Merulius himantioides Fries, FIG. 2.—Merulius lacrymans Wulf. ex Fr.

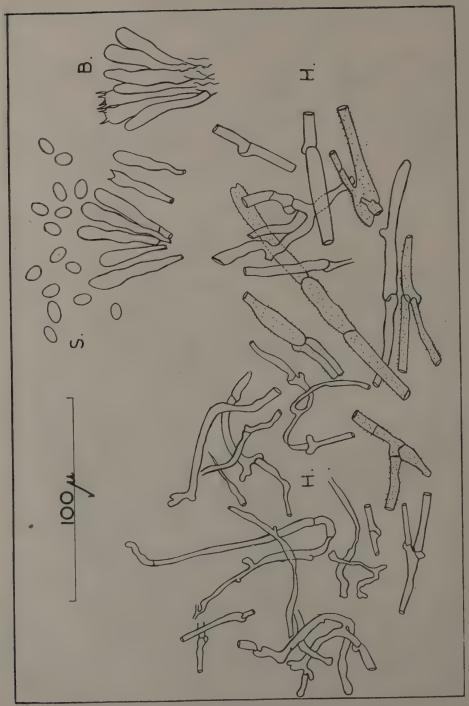


PLATE 22.

Merulius gelatinosus Lloyd.

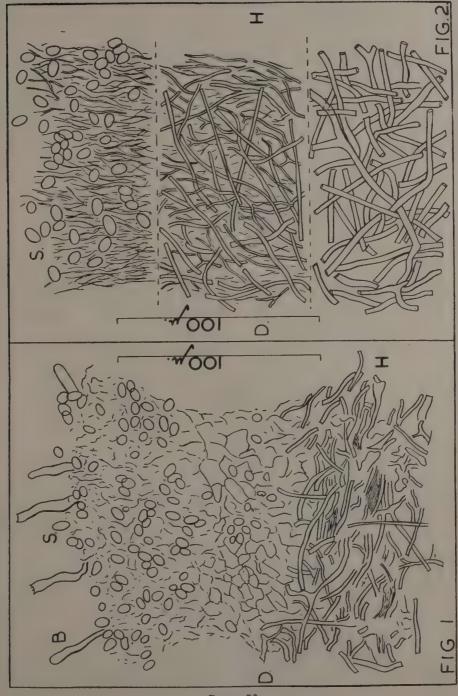


PLATE 23.
FIG. 1.—Coniophora papillosa Talbot.
FIG. 2.—Coniophora fodinarum sp. nov.

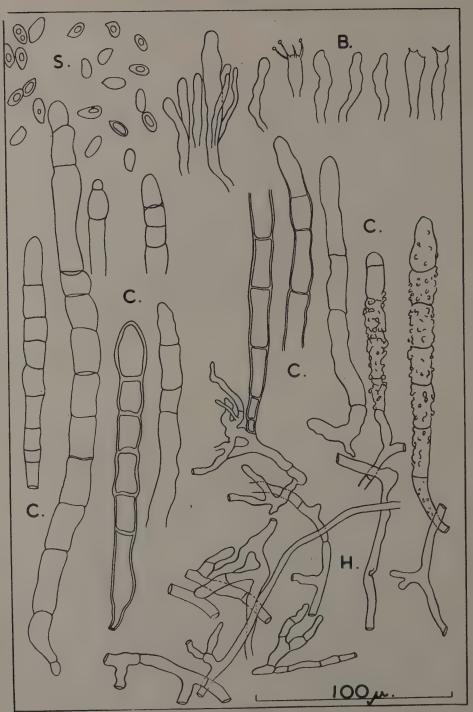


PLATE 24.
Coniophora olivacea (Fr.) Karsten.

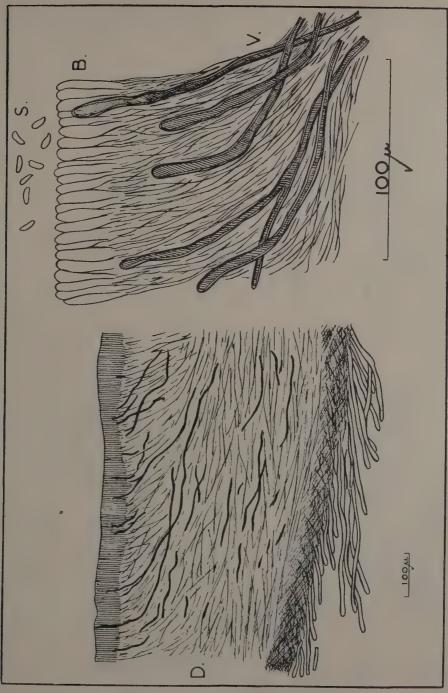


PLATE 25.

Stereum sanguinolentum (A. & S.) Fries.

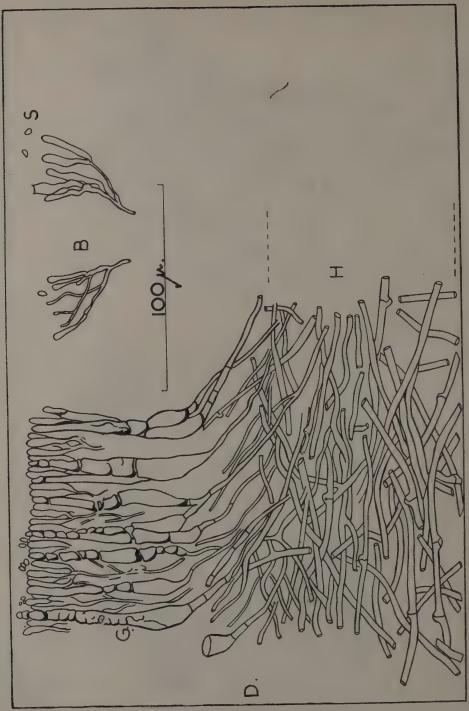


PLATE 26. Stereum bicolor (Pers.) Fr.

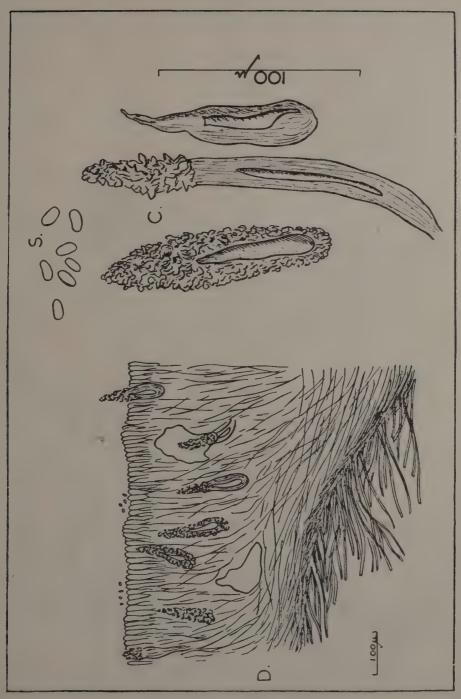


PLATE 27.

Stereum cinerascens (Schw.) Massee.

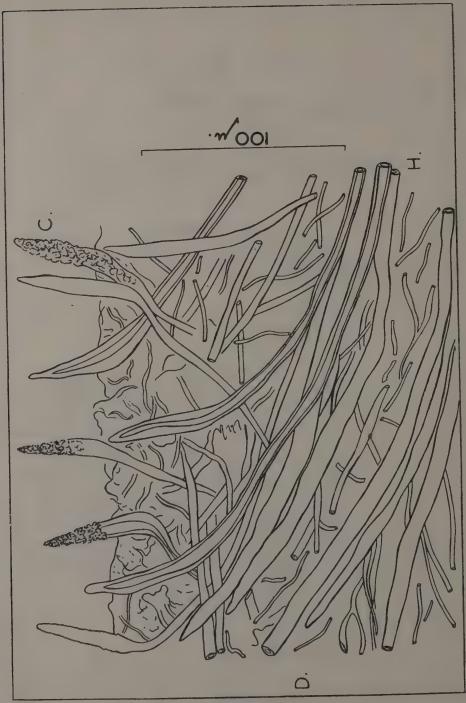


PLATE 28.
Stereum umbrinum B. & C.

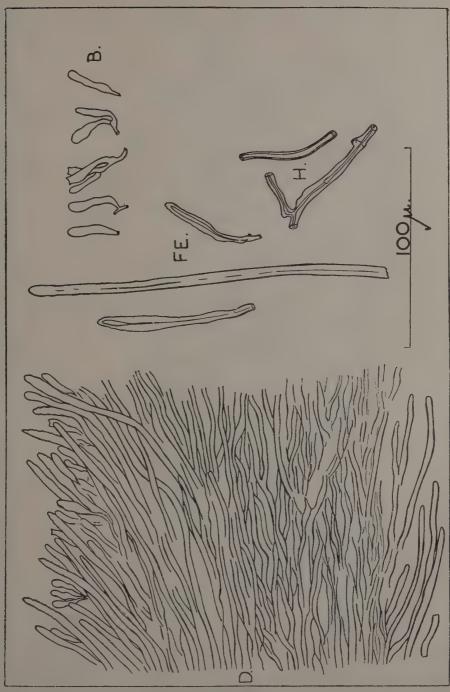


PLATE 29.
Stereum Schomburgkii Berk. Mature stage.

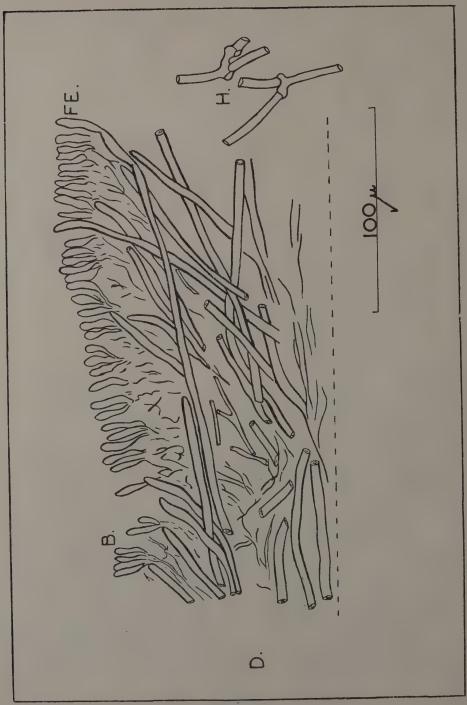


PLATE 30.
Stereum Schomburgkii Berk. Young stage.

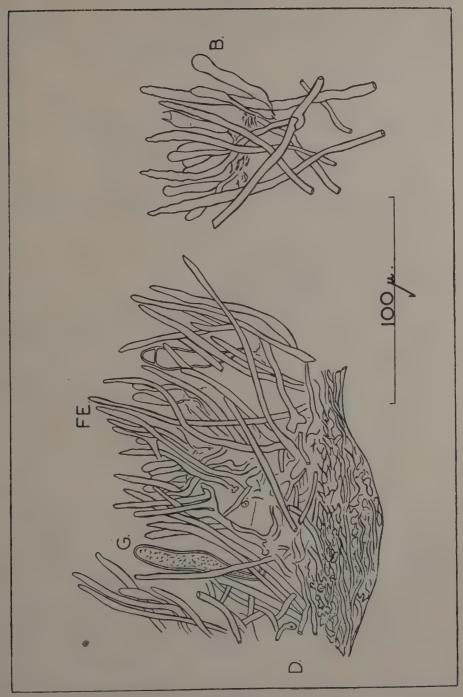


PLATE 31.

Duportella tristicula (B. & Br.) Reinking. Young stage.

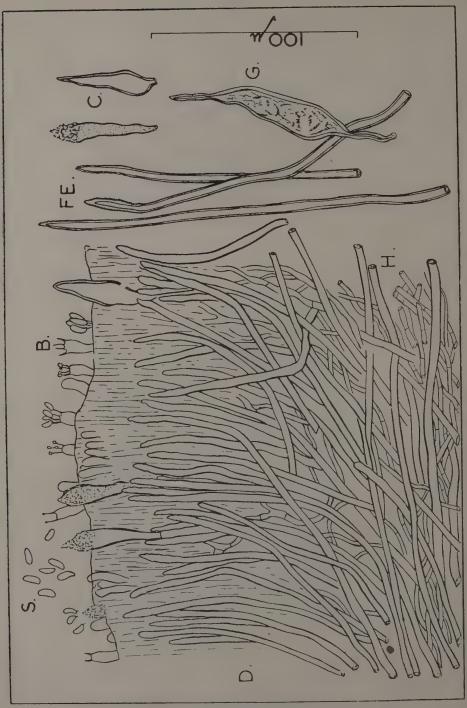


PLATE 32.

Duportella tristicula (B. & Br.) Reinking. Mature stage.

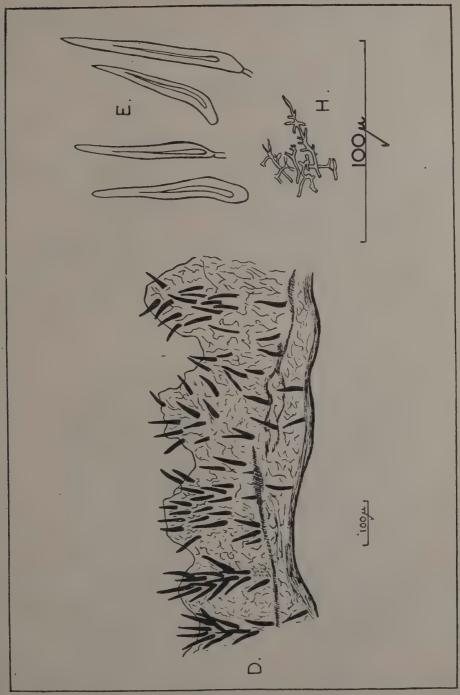


PLATE 33.

Hymenochaete fasciculata Talbot.

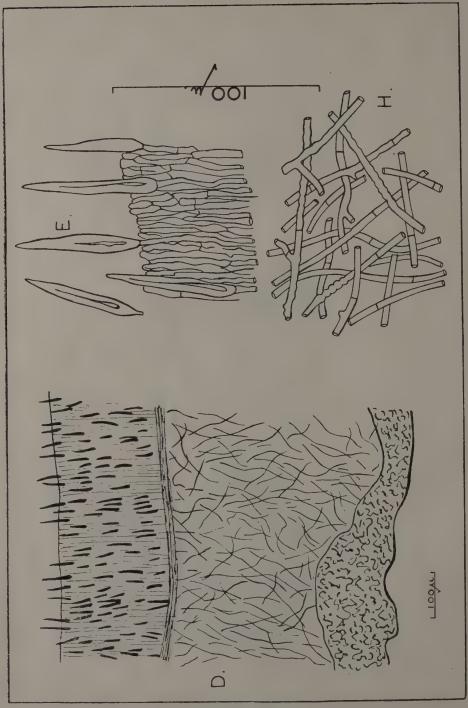


PLATE 34.

Hymenochaete semistupposa Petch.

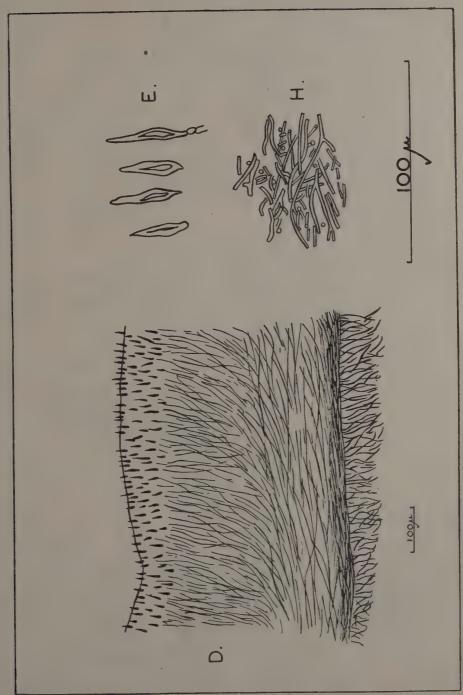


PLATE 35.

Hymenochaete ochromarginata Talbot.

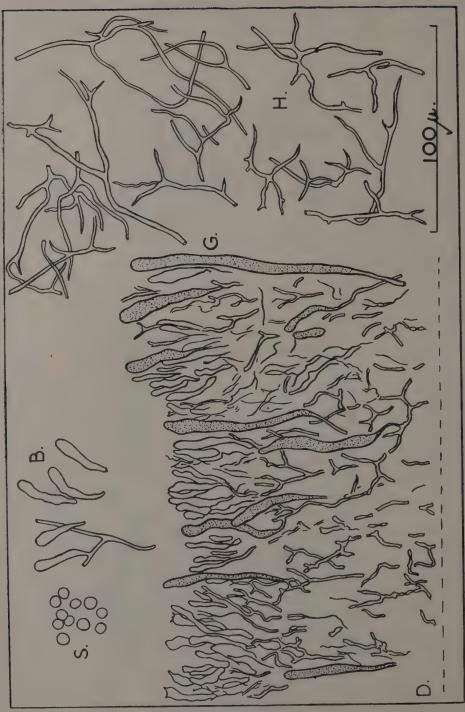


PLATE 36.

Asterostromella duriuscula (B. & Br.) comb. nov.

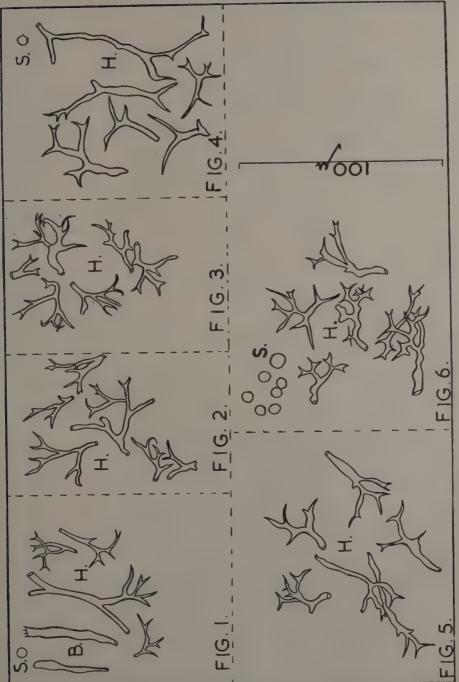


Fig. 1. Fig. 2. Fig. 3.

Swedish collection, Romell (4135), in Herb. Kew.

Asterostromella dura Bourd. & Galz. Hypochnus pallescens (Schw.) Burt.

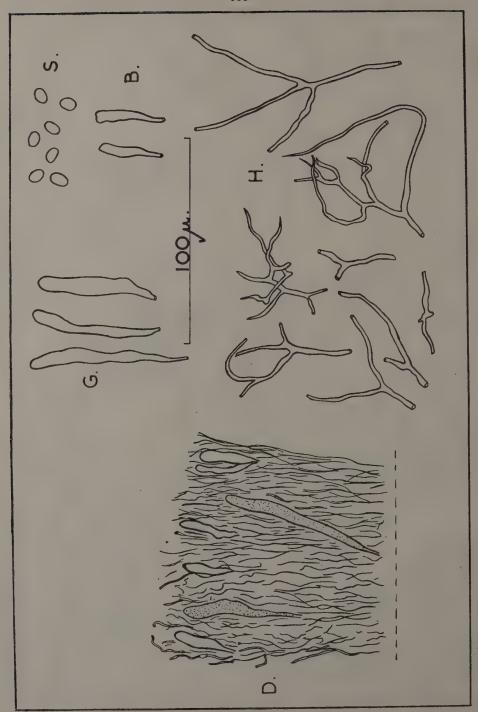


PLATE 38.

Asterostromella Rumpiana Talbot.

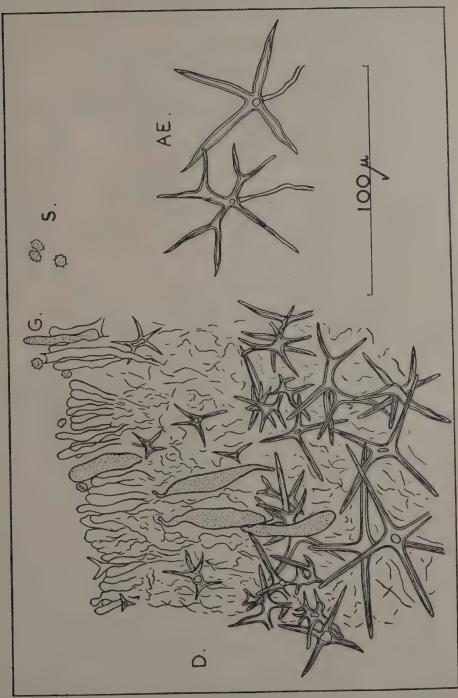


PLATE 39.
Asterostroma cervicolor (B. & C.) Massee.

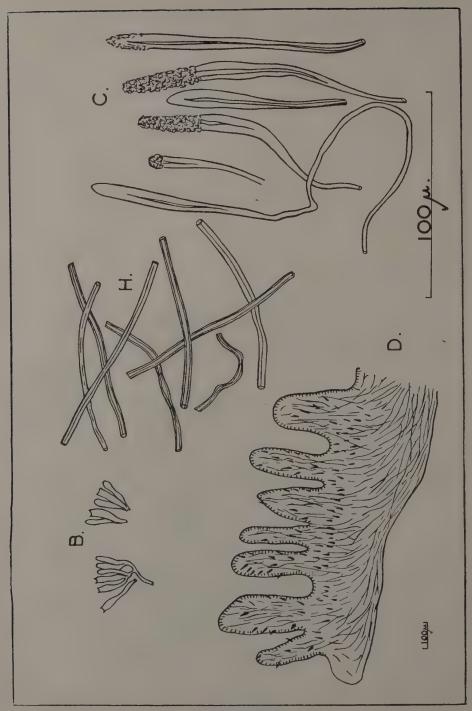


PLATE 40.

Mycoleptodon ochraceum (Pers. ex. Fr.) Pat.

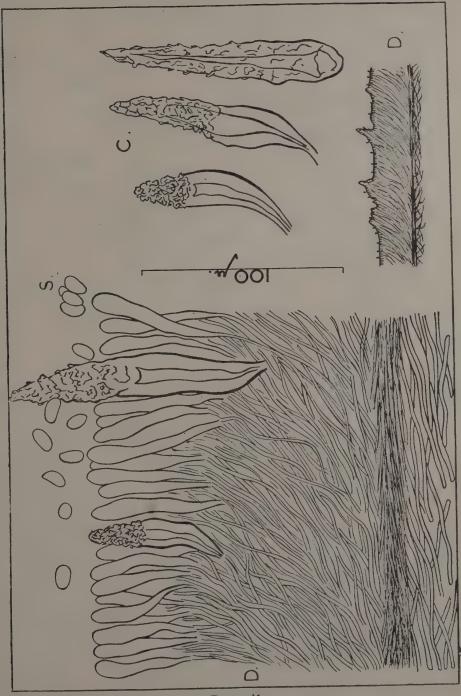


PLATE 41.

Lopharia mirabilis (B. & Br.) Pat.

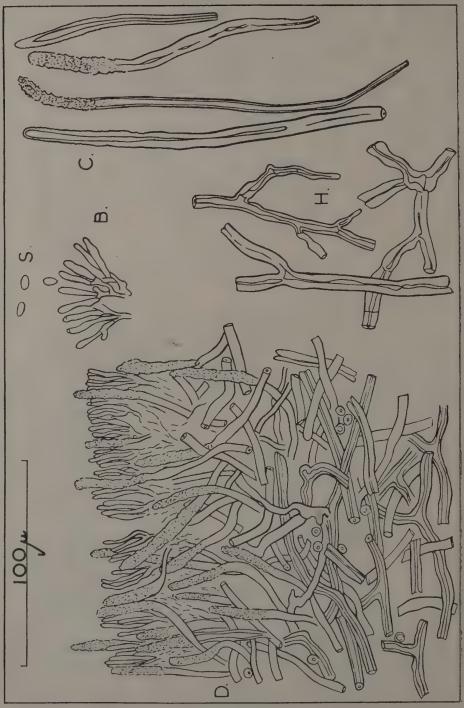


PLATE 42. Lopharia Dregeana (Berk.) comb. nov.

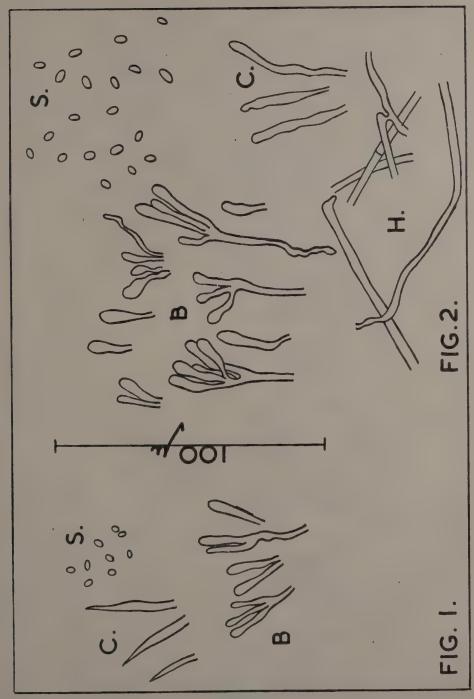


PLATE 43.
Fig. 1.—Acia subceracea Wakef.
Fig. 2.—Acia conferta sp. nov.

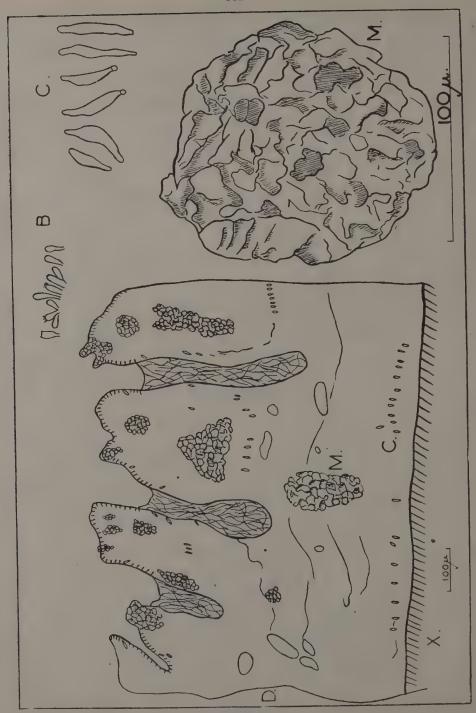


PLATE 44.

Grammothele pseudomappa sp. nov.

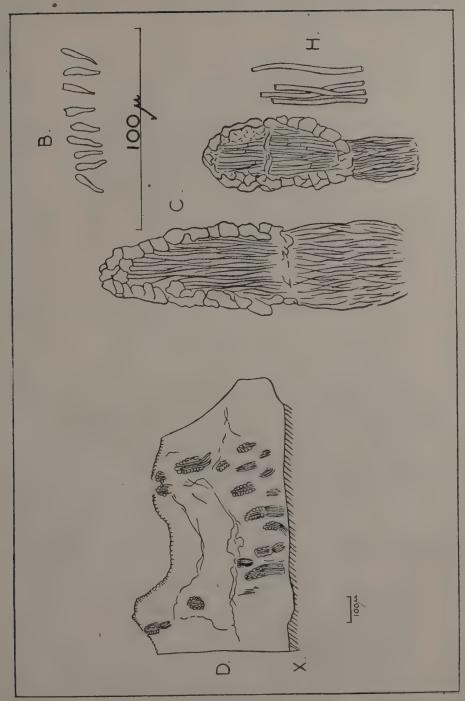


PLATE 45.

Grammothele mappa B. & C.

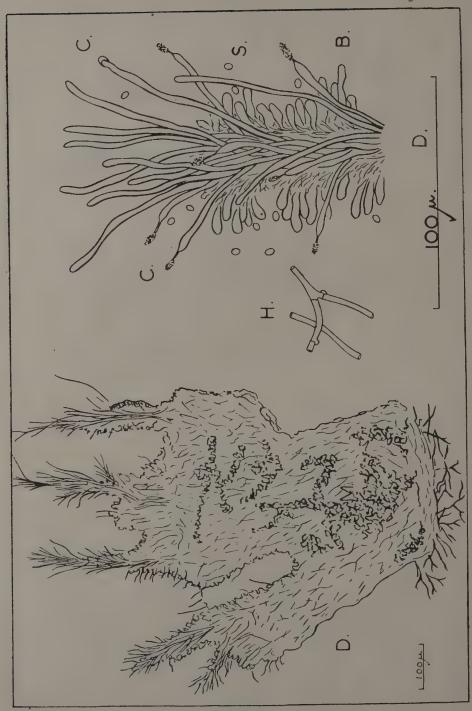


PLATE 46.

Odontia arguta (Fr.) Quélet.

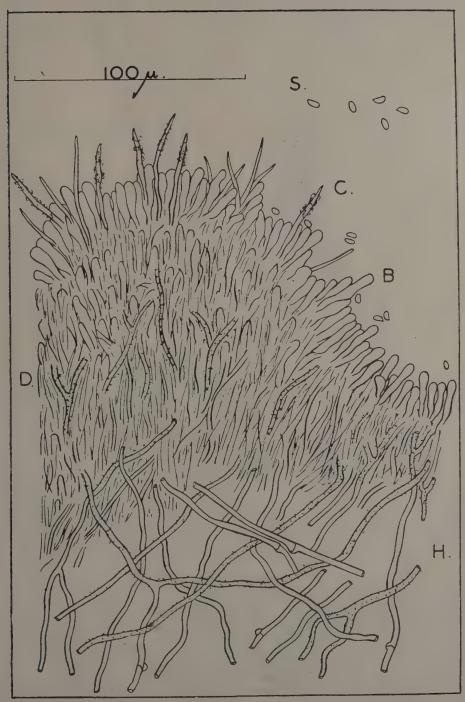


PLATE 47.

Odontia knysnana v.d. Byl.

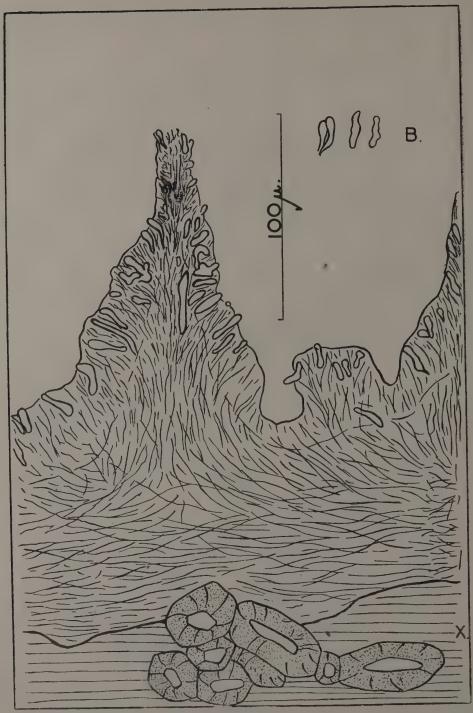


PLATE 48.
Thelepora cretacea. Fries.

A Morphological, Anatomical and Cytological study of Potamophila prehensilis (Nees) Benth.

By B. de Winter.

(Division of Botany and Plant Pathology, Pretoria.)

(Being part of the thesis presented in partial fulfilment of the degree of Master of Science at the University of Pretoria.)

| CONTENTS. | 117 | 117 | 2. Description of the Genus | 117 | 2. Description of the Genus | 118 | 3. Description of the South African Species | 118 | 4. Anatomical Features of the South African Species | 121 | 5. Cytological Investigation of the South African Species | 121 | 6. Remarks and Discussion | 125 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 12

1. INTRODUCTION.

Potamophila prehensilis (Nees) Benth. was first described by Nees in his Fl. Afr. Austr. (1841) under the name Maltebrunia prehensilis. Bentham in 1881 included the genus Maltebrunia Kunth under Potamophila R. Br.

Kuntze in his Rev. Gen. Plant. (1893) and Stapf in Dyer, Fl. Cap. VII (1900) described the uppermost florets of *Potamophila* as hermaphrodite or unisexual with the organs of one sex reduced. Phillips in his description of this genus in his S. Afr. Grasses (1931) makes no mention of this reduction. Moreover, when the descriptions of *P. prehensilis* and *P. parviflora* (type species for the genus *Potamophila* R. Brown) were compared, it appeared rather doubtful whether *P. prehensilis* should be included under this genus.

The present work is an attempt to clear up the doubtful points mentioned above. as well as to investigate the alleged relationship between the *Oryzeae* and the *Bambuseae*,

2. DESCRIPTION OF THE GENUS.

POTAMOPHILA R. Brown.

Potamophila R. Brown, Prodr. Fl. Nov. Holl., ed. 2, 1, 67 (1827); Steudel, Syn. Plant. Glum. 1, 4 (1854); Bentham, Fl. Austr. VII, p. 550 (1878); Bentham et Hooker, Gen. Plant. III, 2, p. 1116 (1883); Stapf in Dyer, Fl. Cap. VII, 658 (1900); Medley Wood, Natal, Plants, t. 444 cum descr. (1905); Stent in Bothalia, I, 4, 274 (1924); Phillips, Gen. S. Afr. Fl. Pl., 82 (1926); Bews, World's Grasses, t. 21, p. 75 (1929) in clavi p. 122; Phillips, S. Afr. Grasses, 169 (1931).

Spikelets laterally slightly compressed on short or rather long pedicels. Inflorescence a lax or contracted panicle. Rhachilla disarticulating above the rudimentary, basal glumes. Florets 3 in number only the uppermost fertile, the lower two reduced to

minute empty lemmas. Uppermost hermaphrodite or unisexual with the organs of one sex reduced. Glumes persistent, reduced to a minute entire or bi-lobed hyaline rim. Empty lemmas reduced, subulate, elliptic and rounded or lobed. Fertile lemma membranous, 5-nerved, nerves sometimes raised or even slightly winged. Palea more or less similar to the fertile lemma but slightly longer and 3-nerved. Lodicules 2, usually large, finely nerved. Stamens 6. Styles 2, distinct; stigmas plumose. Caryopsis obovate, compressed or terete, crowned by the thickened bases of the styles, enclosed by the unaltered lemma and palea, but free.

Tall aquatic or hygrophytic grasses; ligules membranous; panicle effuse or contracted.

A genus with four species; two in Africa (East Africa one, South Africa one); Madagascar one, New South Wales one.

3. DESCRIPTION OF THE SOUTH AFRICAN SPECIES.

Potamophila prehensilis (Nees) Benth.

in Journ. Linn. Soc. 19, 55 (1881); Medley Wood, Natal Plants, t. 444 cum descr. (1905); Stapf in Dyer, Fl. Cap. VII, 659 (1900); Stent in Bothalia 1, 4, 274 (1924) sphalm. prehensiles; Bews, World's Grasses, t. 21, 75 (1929); Phillips, S. Afr. Grasses, t. 48 (1931).

Synonymy. Maltebrunia prehensilis Nees, Fl. Afr. Austr., 194 (1841); Dur. et Schinz, Consp. Fl. Afr. V, 788 (1894) sphalm, praehensilis; Oryza prehensilis (Nees) Steud., Syn. Pl. Glum, 1, 3, (1854).

Perennial, rhizome horizontal, covered with cataphylls, in robust plants more or less strongly branched. Culms erect, climbing, up to 10 m, high or more, slender, many noded; innovations produced intravaginally; nodes swollen, annular, pallid to brownish, glabrous or sometimes minutely hairy; internodes hollow, exserted, terete to slightly laterally compressed, up to 13.5 cm. long, the lower grooved on one side, striate, pallid to greenish, sparsely villous below the nodes or glabrous. Leaf-sheaths tight or more or less lax; retrorsely ciliate along the thin margins, sometimes sparsely long- ciliate at the top or glabrous, slightly keeled, scabrous on the upper part of the keel, strongly striate, lighter in colour than the leaves, slightly auricled. Ligule up to 1 mm. long, membranous, usually truncate, at length becoming fimbriate. Leaf-blades heterophyllous, viz., the usual lanceolate vegitative type and a caudate prehensile linear type (fig. 2). There exists a gradual transition from the vegetative lanceolate type to the linear (caudate) prehensile type of blade, which besides possessing a normal assimilative function, also enables the plant to climb. The extremes, however, are very different in appearance. Lanceolate type, acuminate, up to 14.5 cm. long and 0.6 cm. broad, dark green in colour, flat, more or less flaccid, sparsely hairy, margins and keel usually spiny with minute sharp retrorse barbs; primary nerves 3-5 on each side of the mid-nerve; keel and nerves light yellow or white in colour. Caudate prehensile type, very narrowly linear and much longer than the usual lanceolate type, up to 23.0 cm. long and 0.4 cm. broad, tapering to form a capillary pendent apex; margins and keel very strongly spinous with minute retrorse barbs. Occurring mainly as the first few leaves on young sterile shoots. Flowering branches usually bearing only the lanceolate type of leaf. Panicles terminal on the main culm as well as on the lateral branches, ovate, open and lax, up to 14 cm. in length and 10 cm. wide, the spikelets opening successively from the apex towards the base of the panicle. Branches up to 10 cm. long, spreading, fine, stiff, the lower-most longest and sparingly branched; branchlets 3-4 spiculate; pedicels up to 2 cm. long. Spikelets up to 9 mm. long, broadly lanceolate, slightly twisted, usually glaucous (pallid when young), scabrous, slightly laterally compressed, pedicelled; rhachilla not produced, disarticulating above the rudimentary basal glumes. Florets 3, two represented by empty lemmas, the third hermaphrodite and well developed. Glumes persistent, much reduced, forming a small entire or

bilobed hyaline cup. Sterile lemmas subulate, armed with minute hyaline spines, variable in length. Fertile floret with a well-developed lemma and palea. Lemma about 8 mm. long, boat-shaped acuminate, coarsely covered with hyaline spines, coriaceous clasping the palea with the tough inflexed margins, nerves raised, set with curved hyaline hairs, at times nearly winged. Palea similar to the lemma with the exception that it is 3-nerved, narrower, and possesses hyaline margins. Lodicules 2, broadly ovate, obtuse, fleshy, up to 1·2 mm. long; nerves fine, indistinct. Stamens 6; anthers linear, pale yellow, 6 mm. long. Ovary subglobose; styles distinct; stigmas densely plumose up to 3 mm. long. Caryopsis 5-6 mm. long, brown, spindle-shaped, longitudinally finely ribbed, terete in transverse section. Embryo 1/6-1/7 the length of the grain; hilum linear, as long as the grain; epiblast present, about \(\frac{1}{3} \) the length of the plumule (small). Starch grains compound, more or less globose, each grain composed of about 14 polyhedral granules. Reaction of KI2 with starch normal.

4. ANATOMICAL FEATURES OF THE SOUTH AFRICAN SPECIES.

The abbreviations used in the text figures	designate the following:—
MVR midvein bundle.	Ccniorenchyma.
IVB first order bundle.	BS bundle sheath.
2VBsecond order bundle.	S mechanical tissue (stereome).
3VBthird order bundle.	LClong ripplewalled cell.
UEadaxial epidermis.	SCsilicified cell.
LEabaxial epidermis.	CCsuberized cell.
MCmotor cells.	TRtwo-celled trichome.
ST stomata.	RBretrorse barbs.
Pcolourless parenchyma.	PPpapillae.

Shoot Characters. (Fig. 3D.)

Shoots circular or elliptic in transverse section. Leaves rolled in the bud, protected by the sheaths of the lowermost leaves.

Anatomy of the Leaf Blade. (Figs. 4, 5, 6, 7.)

The description of the anatomy is based on observations made from handcut transverse sections. The epidermi were studied by the aid of surface sections, and maceration of leaf material made it possible to study the shape and size of the cells. Sections were cut near the base of the leaf to bring out certain characteristics. Drawings were made with the aid of a Leitz "Panphot."

The lanceolate type of leaf has the following characteristics:

Leaf blade flat on both surfaces, extremely thin, about 0.055 mm. in cross-section, only about 4-6 cell-layers thick, including the epidermi. Keel prominent rounded, retrorsely barbed. Adaxial epidermis (fig. 6), with 2-3 rows of motor cells between the bundles, followed by 5-6 rows of ripple-walled cells; the rather narrow and constricted silicified cells adjacent to the bundles alternating with the broader suberized cells. Stomata occurring on both sides of the bundles; in a double row next to first and second order bundles, whereas in a single row next to third order bundles. Papillae present on the motor cells. Ripple-walled cells densely covered with papillae. Narrow and shorter cells slightly resembling silicified cells occur between the ripple-walled elements (e.g., long and short elements: Agnes Arber, The Gramineae). Two-celled bulbous based hairs, long, thin, acuminate, situated here and there above the vascular bundles (fig. 3B). Epidermis above the vascular bundles (especially the midrib) Shorter two-celled hairs with thin-walled deciduous apices and retorsely barbed. occurring between the ripple-walled cells. Motorcells usually three in number occupying from one-third to one-half the leaf thickness. Abaxial epidermis (fig. 7) resembling the adaxial except for the absence of the motor cells and more abundant stomata.

Vascular bundles: First order bundles conspicuous, projecting slightly abaxially. axial and abaxial stereome strand present; abaxial strand sometimes only consisting of a few fibres; outer bundle sheath present, consisting of 15-20 parenchyma cells, interrupted by the adaxial stereome strand, inner bundle sheath consisting of 20-22 lignified cells (mid-vein bundle without outer sheath); phloem surrounded by strongly lignified cells; lysigenous cavity and xylem surrounded by parenchyma. Second order bundles occurring infrequently, but constantly submarginally. Third order bundles small; outer sheath complete, consisting of up to 12 parenchyma cells; inner sheath weakly developed, not lignified. Midrib prominent, composed of a well-developed abaxial and a weakly developed adaxial stereome strand together with an abaxial first order bundle and a superposed adaxial amphivasal bundle of the third order; fundamental tissue composed for the larger part of colourless parenchymatous cells with a gradual transition to chlorenchymatous tissue adaxially. Margin rounded, with very little or no schlerenchyma, set with curved broadbased retrorse hairs 0.3 mm. long in the upper two-thirds of the leaf (fig. 3A). Chlorenchyma cells more or less regular in transverse section but with fairly deep invaginations of the cell walls (fig. 4D); in surface section the chlorenchyma also shows invaginations, thus appearing as rows of separate cells (elements). Stereome weakly developed; abaxially a few rows of schlerenchyma cells (fibres) present adjacent to the first and second order bundles; adaxially only a few fibres present. Third order bundles provided with 1-5 fibres both ad- and abaxially. Since there is a gradual transition from the lanceolate type of leaf to the prehensile type (the intermediate types not so frequent), a gradual transition in the anatomical structure from the one type to the other is also met with. The extreme types, however, show marked differences. The midrib of the caudate prehensile type (fig. 5) is much larger and trapezoid in section; except for the superposed amphivasal bundle (third order) and the median first order bundle, two pairs of amphivasal third order bundles are situated lateral to the two median bundles. Furthermore the leaf-blade is much narrower and thicker than the lanceolate type and is set with a greater number of retrorse barbs along the margins and on the keel. Potamophila prehensilis possesses two types of leaf-blade which differ both morphologically and also anatomically from each other; the prehensile leaves predominate on sterile main shoots and aid the plant in its climbing habit, whereas the lanceolate leaves are most frequently met with on the lateral shoots arising intravaginally on the main shoot and which eventually terminate in an inflorescence. P. prehensilis is therefore heterophyllous, a character worthy of note since true heterophylly is of rare occurrence in the Gramineae. The course of the Vascular bundles in the midrib (fig. 8).

Since superposed vascular bundles are rarely met with in the midrib of the leaves of the *Gramineae* (e.g. Bambuseae) and little is therefore known regarding their relative origin and course, a study in this direction was undertaken. This was done on basis of a series of handcut sections prepared from a caudate prehensile leaf in the vicinity just below and above the juncture of blade and sheath. Figure 8 (A-F) depict the origin and course of the finally superposed bundles of the midrib of the leaf-blade. In (A) the midnerve and two lateral third order bundles of the sheath are present. At a slightly higher level (B) the lateral bundles divide, one giving origin to two, the other to three smaller bundles; the third bundle of the latter group gradually moves inward towards the midnerve (C) and finally becomes superposed above the midnerve (D). The two remaining small bundles of the two groups also move apart to occupy respective adaxial and

abaxial positions (E); higher up in the leaf adaxial bundles terminate (F).

In the lanceolate type of leaf something similar happens with the exception that only one of the lateral third order bundles divides into two; one of these branches gradually moves towards the midnerve finally taking in a superposed position above the midnerve. The two remaining bundles ultimately take in an abaxial position in the leaf-blade and hardly are included in the midrib.

Superposed vascular bundles have so far also been met with in the midrib of the leaf of the remaining South African representatives of the Oryzeae, viz. Leersia and Oryza.

5. CYTOLOGICAL INVESTIGATION OF THE SOUTH AFRICAN SPECIES.

Origin of the Material.

Material for this study was collected by Dr. H. G. Schweickerdt at Magoebaskloof in the Northern Transvaal.

Technique.

(cf. "Technique" under Pseudobromus p. 142)

Observations.

Potamophila prehensilis 2n=24 (Fig. 9).

P. prehensilis has a complex of 24 somatic chromosomes. Owing to the smallness of the chromosomes (the length varying from $1\cdot 5-3$ μ) no morphological study of the somatic complement was undertaken. No satellites were found as is reported for Oryza sativa by Nandi (1936) (23). In some metaphase plates an indication of a double structure was found in the split ends of the chromosomes (fig. 9). The position of the constrictions could not be determined. Somatic pairing of chromosomes was found in a few instances. The same phenomenon was reported for the Oryzeae by Ramanujam (1938) (24).

According to Hubbard in Hutchinson's Fam. of Flow. Plants (25) the tribe Oryzeae is composed of two sections, the Oryzinae and Zizaniinae. Hitchcock in his Man. of Grasses of the U.S. (1935) (7) regards the Zizaniinae as a separate tribe. These facts are interesting from a cytological point of view.

Ramanujam (24) maintains that the primary basic number of the *Oryzeae* is five, the section *Zizaniinae* having retained the original basic number, while the *Oryzinae* developed a secondary basic number, twelve. The cytological investigation of the tribe therefore seems to support Hitchcock's classification.

6. REMARKS AND DISCUSSION.

In 1827 the genus *Potamophila* was created by Robert Brown, based on the species *P. parviflora* R. Brown (1). Three years later Kunth in his Rev. Gram. (1830) (2) created the new genus *Maltebrunia* on basis of the species *M. Leersioides*. In 1841 a second species (South African) was described under this genus by Nees in his Fl. Afr. Austr. (3) namely, *M. prehensilis*. Bentham (4), however, regarded the two genera as congeneric and in 1881 included *Maltebrunia* under *Potamophila*, the two genera combined forming (according to his views) a natural genus of three species. There remained, however, certain points of difference between the species. Both Kuntze in his Rev. Gen. Pl. (1893) (5) and Stapf in Dyer, Fl. Cap VII (1900) (6) described the uppermost florets of *Potamophila* as hermaphrodite or unisexual with the organs of one sex reduced, so as to include the South African species, which has the fertile floret of the uppermost spikelets constantly bisexual. A comparison of the characteristics of *P. prehensilis* with those of the type species *P. parviflora* makes it very doubtful whether *P. prehensilis* should be included under the genus *Potamophila* R. Brown. The differences between the two species are given in the following tabulated form:—

P. parviflora R. Br.

- 1. Uppermost florets unisexual or bisexual.
- 2. Lemma and palea membranous, nerves not raised.
- 3. Lemma not clasping the palea.
- 4. Sterile lemmas more or less ovate.
- A hydrophytic canelike grass 1-1½ m. high, leaves narrow and erect.

P. prehensilis (Nees) Benth.

Florets all bisexual.

Lemma and palea hardened, nerves raised.

Lemma clasping the palea.

Sterile lemmas subulate.

A hygrophytic climbing grass, up to 10 m. high, leaves heterophyllous.

Taking the above differences into consideration and amplified by further cytological and anatomical study of the two species in question, it may result in the necessity of creating a new genus to accommodate the species *P. prehensilis* (Nees) Benth.

Mention should be made of the totally misleading representation of the habit of *Potamophila prehensilis* by Bews (20). Study of the species in its natural habitat has shown it to be a climber able to reach a height of \pm 10 meters, aided in this respect by the caudate prehensile leaves; the numerous inflorescences are not only borne terminally on the main shoots but also on relatively short lateral branches.

The interpretation of the spikelet in the *Oryzeae* has proved difficult mainly on account of the "palea" of the fertile floret not being two-keeled and two-nerved (as is usually the case in the *Gramineae*), but being dorsally keeled and three-nerved.

Much difference of opinion, however, still seems to exist in the interpretation of the lower part of the spikelet as well.

Hitchcock (7) interprets the spikelet of the *Oryzeae* as follows: the glumes are small (sometimes much reduced) structures, followed by the three-nerved lemma subtending the fertile floret. The palea is three-nerved and similar in texture to the lemma. According to this interpretation the spikelet is one-flowered and disarticulates entire, i.e., with glumes attached.

Most authors, however, interpret the spikelet as being one- to three-flowered (fig. 10A). This interpretation was originally put forward by Stapf (8) and is supported by agrostologists of the front rank, i.e., Arber (9) and Hubbard (10A). The inconspicuous hyaline two-lipped cuplike structure (which may be reduced to a mere rim), present at the base of the spikelet, is interpreted as representing the reduced glumes; the successive structures (regarded as glumes by Hitchcock and others) represent two sterile lemmas (florets), whereas the third floret is terminal and hermaphrodite. According to this interpretation (fig. 10A) the tip of the rhachis would be situated between the palea of the third lemma (F) and the sterile lemma (D) of the second floret.

Arber investigated the spikelet anatomically and by study of transverse sections of the spikelet, arrived at the conclusion that the two scales at the apex of the pedicel occupy a position corresponding to that of glumes.

Hubbard, in his description of *Oryza australiensis* Domin, pointed out that the basal bracts in this species, although small, are not only larger than in most of the other species of *Oryza*, but are two quite distinct structures. These represent the much-reduced glumes. By the discovery of rice spikelets bearing abnormal florets in the axils of the bracts below and preceding the fertile floret, by Michaud (11), the identity of these structures (sterile lemmas) has apparently finally become established. Despite all the arguments forwarded in favour of Stapf's interpretation of the rice spikelet, Backer (12) recently reverted to support the older interpretation of Hitchcock.

Chatterjee (13) after giving an outline of the history of the various interpretations concerning the structure of the rice spikelet, votes in favour of Stapf's interpretation; he furthermore proceeds to criticise the arguments forwarded by Backer against Stapf's interpretation. Comparing the tip of the pedicle of *Oryza* (i.e., glumes sensu Stapf), with the cupular structure occurring at the base of the spikelet in the genus *Asthenochloa*, Backer apparently considers these organs homologous. Since the genera *Oryza* and *Asthenochloa* belong to distinct tribes, these structures may equally well be considered analagous, and need not necessarily be homologous. Chatterjee furthermore points out that in certain species of *Oryza* the cupular structure occurring at the apex of the spikelet is distinctly bi lobed; in fact these lobes are not attached to the axis on the same level, but on different levels, viz., one is attached slightly above the other (cf. *O. australiensis* Domin and *O. ridleyi* Hook fil.).

In the present investigation it was found that the pedicel tip of Potamophila also is distinctly bi-lobed, the lobes being attached to the axis on different levels. (cf. fig. 1B).

Moreover, either of the two sterile lemmas may at times subtend a very delicate hyaline and much reduced palea (fig. 1B). The presence of this palea had already been observed by Stapf, and was indicated by him in his drawings of a dissection of a spikelet taken from a Drege gathering, although no mention is made of this in his account of the species in the Fl. Cap. VII. Both drawing and sheet are deposited in the Herb. Benth. at Kew. The position of the lemma subtending the palea is such that the two lowermost hyaline bracts must undoubtedly be regarded as representing much reduced glumes (fig. 1B).

Two different hypotheses have been put forward to explain the presence of the

dorsally keeled three-nerved "palea" of the Oryzeae.

The generally accepted theory is that the fertile floret consists of a lemma subtending a true palea, which is three-nerved and similar in substance to the lemma. In an effort to prove this interpretation Rossberg (14) endeavoured to indicate that it is possible that a true palea may at times be more than two-nerved and dorsally keeled. It must be admitted that his arguments are quite plausible. Seen in the light of recent discoveries, however, his theory when applied to the *Oryzeae*, is difficult to maintain.

A totally different interpretation of the upper part of the spikelet was advanced

independently by Peterson (15), Pilger (16) and Parodi (17).

To explain the presence of the six stamens and three-nerved "palea" of the rice spikelet Peterson assumed the spikelet to be two-flowered, the lower flower being perfect and the upper staminate. The structure usually considered to be the "palea" is really the lemma of the staminate floret, while the pales of both are thus wanting.

Parodi's interpretation is essentially the same as Peterson's, but the former gives a more detailed exposition of his views, supported by morphological evidence (18).

Parodi regards the upper part of the spikelet as the result of the fusion of two florets, of which the pales of both and the pistil of one has disappeared, thus giving rise to a floret composed of a single ovary and six stamens (cf. fig. 11B). Subsequent to the publication of this theory a rice plant with abnormal spikelets containing two grains as well as two bi-nerved pales was actually found. These addorsed pales originating from the inner basal part of the spikelet, together with the two outer bracts, may thus be regarded to correspond with the two florets fused to form (together with the glumes and sterile lemmas) the typical spikelet of the *Oryzeae*.

The unusual structure of the spikelet and the absence of evident affinity with other tribes of the Gramineae, induced Parodi to create the independent subfamily the Ory-

zoideae to accommodate the tribe Oryzeae.

It may be mentioned here that a cross-section of a rice spikelet with two florets

was illustrated by Schuster (19) in 1910.

In spite of the observations mentioned above, Chatterjee dismissed Parodi's theory as a bold assumption, without commenting on the morphological evidence in favour of such an interpretation. Moreover he remarks that he has no doubt that the dorsally-keeled three-nerved structure (occupying the position of a palea) is indeed a true palea, because in the mature caryopsis the hilum points towards this structure. It might be pointed out that according to Parodi's interpretation the hilum would in any case be turned towards the upper lemma ("palea" sensu Chatterjee).

Pilger's theory (fig. 10B and 11A) mainly agrees with that of Peterson and Parodi. Pilger, however, regards the spikelet as the product of the fusion of two florets of which the pales of both and the pistil stamens and lodicules of one have disappeared. This implies that Pilger regards the *Oryzeae* as derived from ancestors with six stamens per floret, whereas Parodi regards the relatively high number of stamens, as the result of the combination of two sets of three stamens,* i.e., originating from an ancestral stock

with three stamens per floret.

^{*} One of the characteristics used by Parodi as a basis for his theory, is that the spikelet of the Oryzeae contains six stamens (not three). From this one can conclude that the six stamens normally found in this tribe is regarded by Parodi as the result of the fusion of two sets of stamens originating from different florets.

It does seem more logical to accept Pilger's view of the sequence of reduction in the floret (Fig. 11A). According to Pilger the upper floret has disappeared through a downward reduction, while the consequence of Parodi's theory is that the reduction has taken place from above, as well as from below, leaving only the stamens intact (cf. fig. 11B). If it is assumed that the upper floret is male, one still has to account for the disappearance of the lodicules, which have not been included in the typical rice spikelet through fusion of the two florets (2 lodicules are typically present). Apart from this fact certain characters of the *Oryzeae* pointing to a phylogenetic relationship with the *Bambuseae*, a tribe where 6 stamens per spikelet is of common occurrence, seem to indicate Pilgers's interpretation as the most acceptable one.

The Oryzeae on the whole form a well-defined group exhibiting no evident relationship to other tribes. The tribe nevertheless exhibits a number of characters which are indicative of a possible phylogenetic relationship to the Bambuseae; these characters are being put forward in the following tabulated form:—

ORYZEAE

the above tribe likewise.

Likewise.

BAMBUSEAE

1. Reduction of the florets in the spikelets has taken place in both an acropetal and basipetal direction.

2. The "palea" may be dorsally keeled and similar to the Likewise, lemma (Melocanninae).

3. Stamens usually 6 per floret. Likewise.

4. Styles 2-3. Styles two, occasionally a third non-

stylar process present.

5. Caryopsis with an elongated linear hilum.6. Epiblast large and broad.Likewise.

7. Starch grains compound. Likewise.

8. Chlorenchyma of the leaf possesses conspicuously invagiLikewise.

nated cell walls.

9. Vascular bundles in the mid-rib of the leaf blade are often
In the S. African representatives of

10. Basic chromosome number x=12. Likewise.

superposed.

According to Bews (20) Camus furnishes the following information regarding the spikelet of the *Bambuseae*: the spikelets are usually several-flowered, but often only one floret per spikelet is fertile; moreover, the reduction of the floral parts in the spikelet has taken place both from above as well as below. The structure of the *Oryza* spikelet is thus very similar to that met with in the *Bambuseae*, that is, if Pilgers's interpretation is accepted; reduction in the *Oryza* spikelet has, however, progressed much further.

The keelless "palea" and its similarity to the lemma as met with in the *Melocanninae* suggests a possible relationship to the "palea" of the *Oryzeae*. In *Dinochloa* this "palea" may be absent and reduction has here progressed to an extreme.

In the discussion of abnormal rice spikelets discovered, Michaud pointed out that in certain of the spikelets studied, an abnormal flower with an indurate three-nerved palea was found to be present in the axil of one of the usually reduced sterile lemmas.

Concluding her discussion she remarks that if Parodi's and Peterson's hypothesis is accepted, the presence of a flower in the axil of one of the usually sterile lemmas, similar in structure to the normal flower found in the *Oryzeae*, "is a strong indication that a branching system is involved," and that if this is actually the case, it "would lend strong support to Parodi's suggestion that the *Oryzeae* constitute a separate sub-family."

It is possible that the somewhat similar development found in certain members of the *Bambuseae* where inflorescences are known to develop in the axils of lemmas [as

indicated by Pilger (21) in the genus Guadua] may also be regarded as evidence of a relationship between the Oryzeae and Bambuseae.

Examination of the chlorenchyma of the leaf of all the South African representatives of the *Oryzeae* has revealed the presence of conspicuously invaginated cell-walls.

In this respect the *Oryzeae* strongly resemble various representatives of the *Bambuseae* cf. Haberlandt (22).

Superposed vascular bundles occur in the midrib of the leaf of all South African representatives of the *Oryzeae*, a character which is likewise met with in the *Bambuseae*, e.g., in the leaves of our native bamboo *Arundinaria tesselata*.

A more comprehensive anatomical study of the various genera of the two tribes concerned may possibly furnish additional evidence of a close phylogenetic relationship between the *Bambuseae* and the *Oryzeae*.

7. MATERIAL EXAMINED.

f. IVALAL ZALANIA
Abbreviations used for the various Herbaria are as follows:-
BOL Bolus Herbarium, Cape Town.
CTM South African Museum, Cape Town.
GRA Albany Museum, Grahamstown.
NH Natal Herbarium, Durban.
NII Natal University College, Pietermaritzburg
PRE National Herbarium, Pretoria.
STELL University of Stellenbosch.
UPR University of Pretoria.
The following material was examined:

CAPE PROVINCE.—Willowvale district: Neeyele Forest (also at Monubu), alt. 500', IV., 1906, Pegler 1338 (BOL, CTM, GRA, PRE). King Williamstown district: Perie bush, III., 1894, Schönland 856 (GRA). Do., Perie, XI., 1901, Sim 2809 (GRA, PRE). Lusikisiki district: Igosia Forest, Pondoland, IV., 1918, Mogg 362 (NU). Port St. Johns district: Port St. Johns River, IV., 1918, Pole Evans H. 18039 (PRE). Do., Port St. Johns, XII., 1943, Schelpe 367, (NU). Umzimkulu district: Insikini, Nlokolwana Forest, creeping grass, good fodder grass, IV., 1925, Miller 6045 (PRE).

NATAL PROVINCE.—Port Shepstone district: Oribi Gorge, IV., 1937, McClean 473 (NH). New Hanover district: Blinkwaterbos, II., 1944, Schweickerdt 1532 (NU, UPR). Lions River district: Karkloof Forest, III., 1940, Ryecroft 8 (PRE, NU). Pietermaritzburg district: Town Bush—Masais Farm, III., 1946, Clarkson 256 (NU). Do. Town Bush Valley, alt. 3,200′, IV., 1946, Fisher 1018 (NU). Do., near Curryspos, VII., 1945, Acocks 11580 (PRE). Inanda district: Inanda, alt. 1,800′., XII., 1886, Medley Wood 558 (CTM). Do., Inanda, X., 1881, Medley Wood 1305 (BOL, CTM). Do., Inanda Heights, III., 1940, Schweickerdt 1432 (NH, PRE). Do., about 10 miles from Verulam on road to N'dedwe, first record of fruiting material, IV., 1940, Schweickerdt 1441 (NH). Do., Verulam, near N'dedwe, IV. 1940, Schweickerdt 1450 (NH, PRE). Richmond district: in moist forests, climbing 30′ or more up trees, IV. 1832, Galpin 11955 (PRE). Zululand, N'kandla district: Qudeni Forest, alt. 5,000′, II., 1940, Fisher et Schweickerdt 82 (NU, PRE). Do., Qudeni Forest, alt. 5,000′, II., 1940, Fisher et Schweickerdt 117 (NU, PRE). Eshowe district: Eshowe, IV, 1941, McClean 1002 (NH). Do., Eshowe Forest, tolerates a lot of shade, III. 1927, Kotze 248 (PRE). Between Ubombo Magistr. and Ugaza Mountains—Mkuzi Station, IV., 1944, Gerstner 4502 (PRE).

TRANSVAAL PROVINCE.—Pietersburg district: The Downs, Junod 4103 (TRV). Letaba district: De Hoek, Houtbosch, I., 1945, Schweickerdt 1557 (UPR, NU). Do., De Hoek, Houtbosch, I., 1945, Schweickerdt 1562 (UPR, NU). Do., De Hoek by Haenertsburg, VII., 1944, Enslin et Schweickerdt (UPR). Do., near Magoebaskloof

Hotel, IV., 1942, Codd and Muller 360 (PRE). Do., Magoebaskloof (Diepkloof), IV., 1946, de Winter 105 (UPR). Do., Magoebaskloof, Patattabos, IV., 1946, de Winter 107 (UPR). Zoutpansberg district: Louis Trichardt, Hangklip, I., 1945, Schweickerdt 1566 (UPR, NU).

Fragments Ex. Herb. Hort. Bot. Reg. Kew.—Natal: Umpumulo, common in bush, alt. 2,000' to down to the coast, XI., 1875, Buchanan (PRE). Natal, Dumisa, Ellesmere, im Unterholz shatt. Wälder, VI., 1912, Rudatis 1651 (PRE). Cape Province, Transkei, Kentani near Manubi, XII., 1911, Saxton 28 (PRE).

Authentic material, fragment of Drége 4352 (PRE) Isotype.

Type Specimen (not seen).—The type specimen Drége s.n. is deposited in the Botanisches Museum, Berlin-Dahlem and does not bear any locality except that it comes from Natal. According to Dr. H. G. Schweickerdt this sheet is probably of the same gathering as Drége 4352, ex Herb. Lübeck, which was seen and identified by Stapf.

8. ECONOMIC NOTES.

Collector's notes furnish information to the effect that this grass is heavily browsed upon by game and thus only reaches the flowering stage in less readily accessible situations. The species is furthermore reported to be a good fodder grass for stock.

Vernacular names.

Afr.: Klimgras; Klimopgras. Zulu: uBabe wehlathi.

9. DISTRIBUTION OF THE SOUTH AFRICAN SPECIES (FIG. II).

The species occurs at an altitude from 500 ft. up to 6,000 ft. It is one of our most characteristic hygrophytic forest grasses and is an important component of the undergrowth of the low-lying riparian forests and at higher altitudes the more temperate mist belt forests of the eastern escarpment (see map). The species prefers shady, moist localities. As far as is known at present its northernmost limit appears to be the southern slopes of the Zoutpansberg.

10. SUMMARY.

- 1. A detailed description of the morphology and anatomy of *Potamophila prehensilis* (Nees) Benth is given. It is pointed out that true heterophylly occurs in this plant; a rare occurrence in the *Gramineae*.
 - 2. The chromosome number of P. prehensilis is 2n=24.
- 3. A comparison of the characteristics of *P. prehensilis* with those of the type species of the genus *P. parviflora* makes it extremely doubtful whether the former should be included in the genus *Potamophila* R. Br. Further study of the two species in question may result in the necessity of creating a new genus to accommodate the species *P. prehensilis* (Nees) Benth.
- 4. A discussion concerning the interpretation of the rice spikelet in the light of recent discoveries is given. Pilger's interpretation is regarded as the most satisfactory explanation of the anomalies found in the rice spikelet. Pilger interprets the spikelet as being four-flowered with the two lowermost florets reduced, while the upper part of the spikelet is the result of the fusion of two florets of which the pales of both and the lodicules stamens and ovary of the upper have disappeared, thus giving rise to a floret composed of a single ovary and six stamens enclosed by two lemmas, the lower being 5-nerved and clasping the upper, which is 3-nerved and dorsally keeled.

5. The author has endeavoured to enlarge on the alleged phylogenetic relationship between the *Oryzeae* and *Bambuseae*. Several morphological and anatomical similarities hitherto unknown have been recorded.

10. LITERATURE CITED.

		10.
1.	Brown, R	Prodromus Florae Novae Hollandiae, ed. 2, 1, 67 (1827).
2.	Kunth	Rev. Gram. p. 183, t. 3, En. 1, p. 8 (1830).
3.	NEES	Florae Africae Austral., 1, p. 194 (1841).
4.	BENTHAM	In Journ. Linn. Soc. 19, 55 (1881).
5.	Kuntze	Rev. Gen. Pl. (1893).
6.	STAPF, O	In Dyer, Fl. Cap. VII, 659 (1900).
7.	Нітснсоск	Manual of the Grasses of the U.S. (1935).
8.	STAPF, O	Ex Hook. f. in Trim. Fl. Ceyl., 5, 182 (1900).
9.	Arber, A	The Gramineae, 184 (1934).
10.	HUBBARD, C. E	Hooker's Icones, Pl. 3232 (1934).
11.	MICHAUD, V	Bull, Torr. Bot. Club, 71, 624 (1944).
12.	BACKER, C. A	Blumea, Suppl. 3, 45 (1946).
13.	CHATTERJEE, D	Nature, 160, 4059, 234 (1947).
14.	Rossberg, G	Beitrage zur Morphologie des Grasährchens, 24 (1935).
15.	PETERSON, N. F	Nebraska Acad. Sci., 6 (1935).
16.	PILGER, R	In Bot. Jahrb., 69, 4 (1939).
17.	PARODI, L. R	Gramineas Bonariensis, 61 (1939).
18.	PARODI, L. R,	Primera Reuneon Argentina de Agrinomia, 55 (1939).
19.	SCHUSTER, J	Ueber die Morphologie der Grasblüte. Flora 100 (1910).
	BEWS, J. W	World's Grasses (1929).
21.	PILGER, R	In Berichte d. Deut. Bot. Gesellsch. XLV. (1927).
22.	HABERLANDT	Physiological Plant Anatomy 278 (1928).
23.	NANDI, H. K	Journ. Genetics, 33, 315 (1936).
24.	RAMANUJAM, S	Annals of Bot. II, V., 107 (1938).
25.	HUTCHINSON	Fam. Fl. Plants (1934).

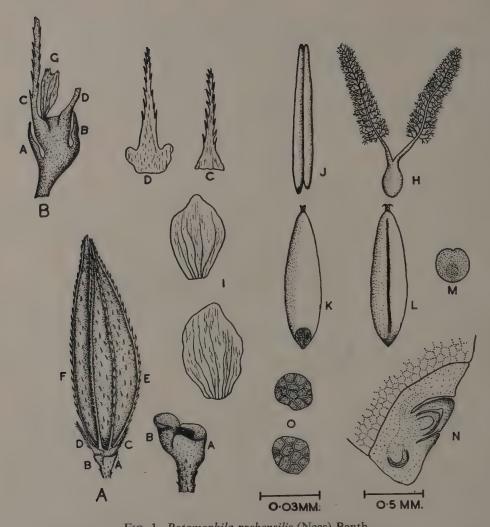


FIG. 1. Potamophila prehensilis (Nees) Benth.

A, Spikelet. B, Base of the spikelet. A, lower glume; B, upper glume; C, sterile lemma1; D, sterile lemma 2; E, lemma; F, palea; G, reduced palea; H, pistil; I, lodicules; J, anther; K, caryopsis, dorsal view; L, caryopsis, ventral view; M, cross-section of the caryopsis; N, longitudinal section of the embryo; O, compound starch granule.—(Schweickerdt 1532).

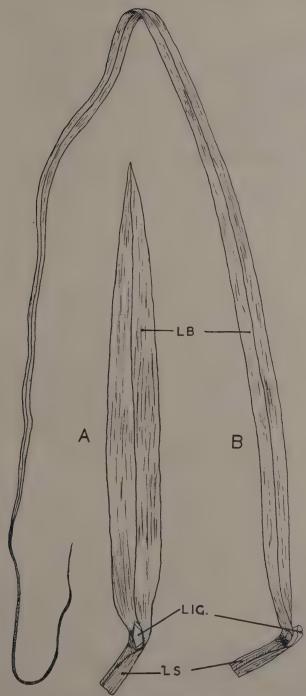


Fig. 2.—A, lanceolate type of leaf. B, caudate prehensile type of leaf.

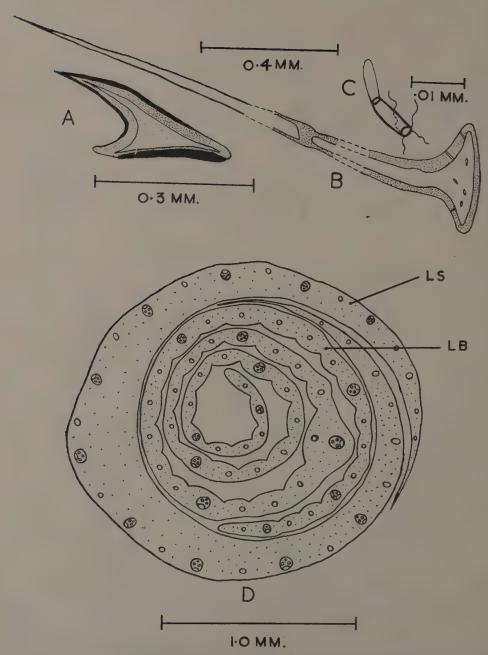
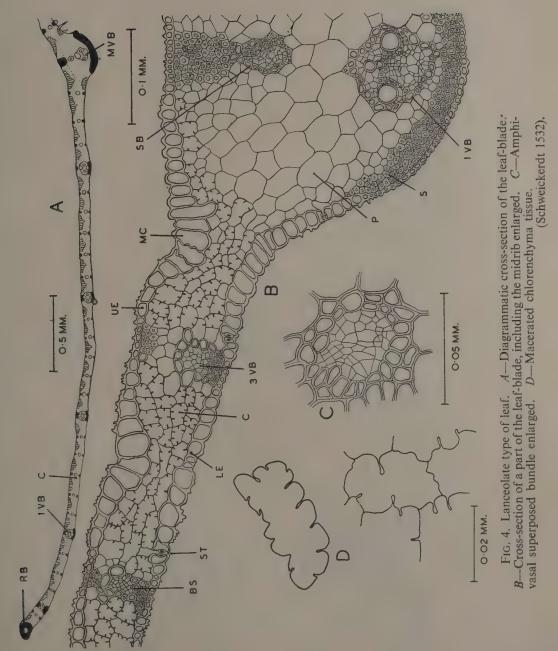
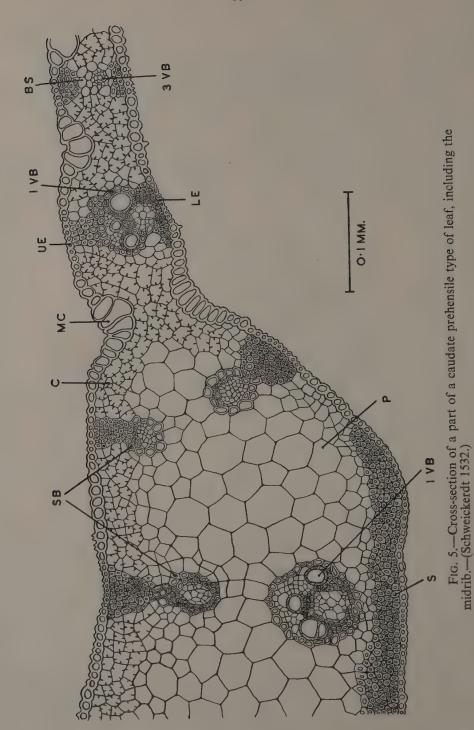


Fig. 3.—A—Broadbased retrorse barb. B—Long thin two-celled hair. C—Two-celled deciduous hair. D—Cross-section of the shoot.





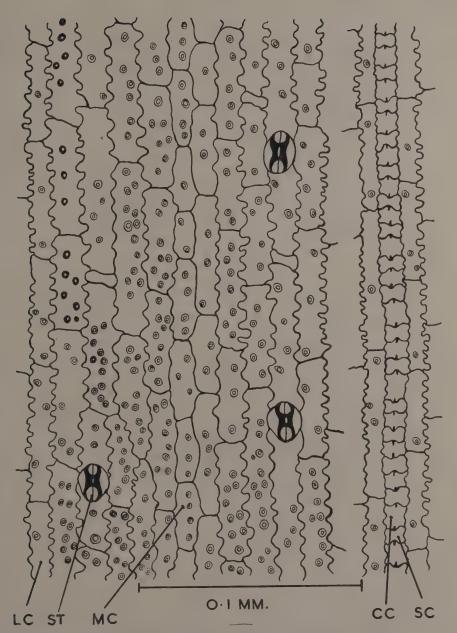


Fig. 6.—Adaxial epidermis of the leaf-blade.—(Schweickerdt 1532.)

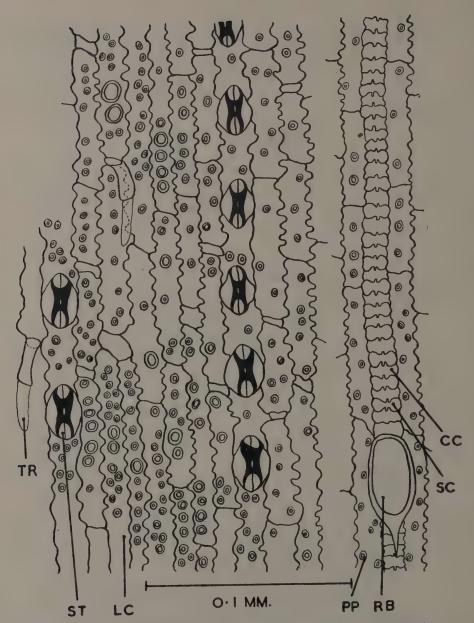


Fig. 7.—Abaxial epidermis of the leaf-blade.—(Schweickerdt 1532.)

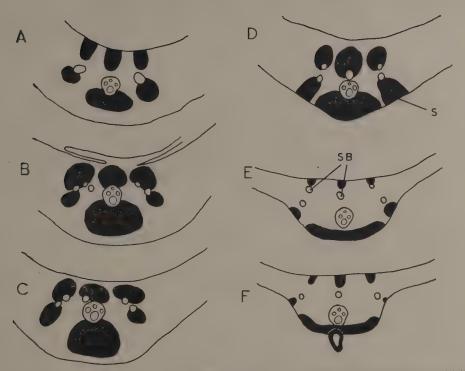


Fig. 8.—Diagrammatic drawing of the course of the vascular bundles in the midrib of a caudate prehensile type of leaf.—(Schweickerdt 1532.)



Fig. 9.—Polar view of a metaphase in a root-tip cell.

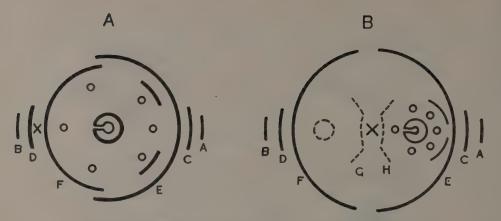


Fig. 10.—Diagrammatic drawing to illustrate the different interpretations of the spikelet of the Oryzeae.

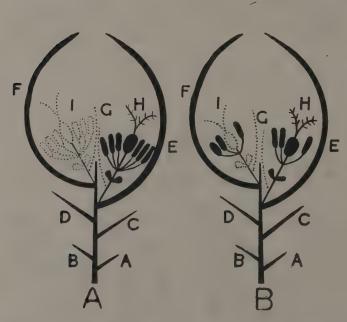


FIG. 11.—Diagrammatic drawing to illustrate the difference between the interpretations of the rice spikelet. A—According to Pilger. B—According to Parodi. A—lower glume. B—upper glume. C—first sterile lemma. D—second sterile lemma. E—lower lemma of fertile floret. F—upper lemma of fertile floret. G—pales. H—lower floret. I—upper floret. (The dotted lines indicate reduced structures.)

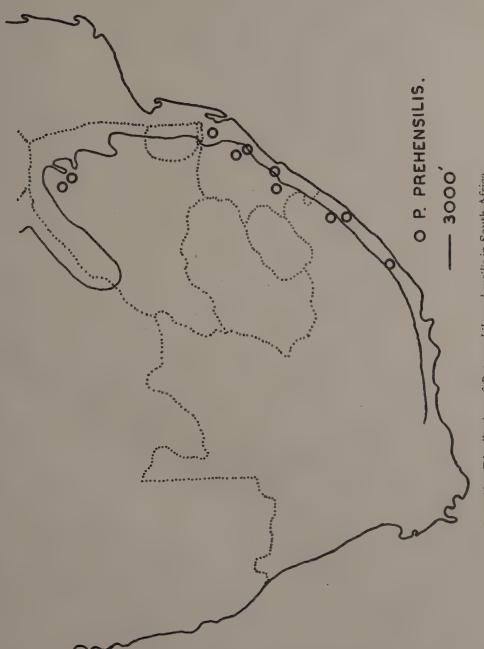
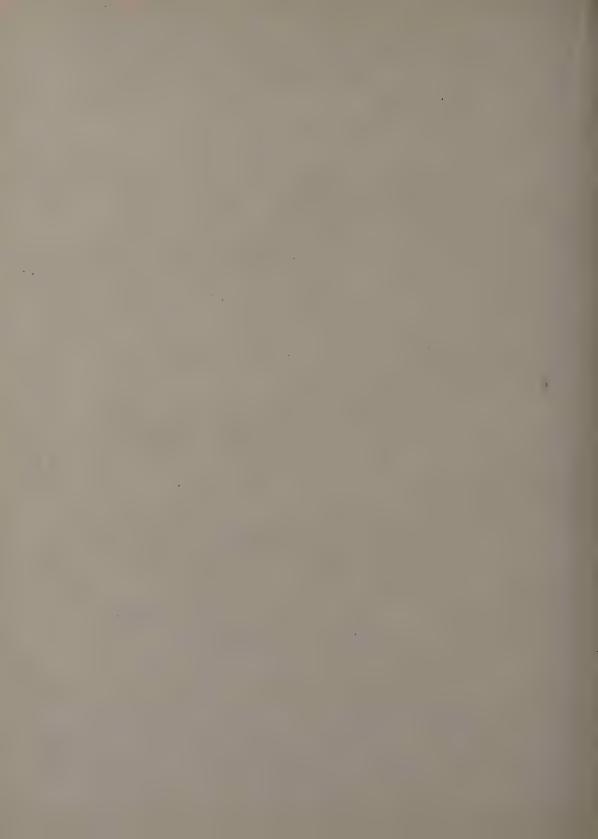


Fig. 12.—Distribution of Potamophila prehensilis in South Africa.



The Taxonomy, Anatomy and Cytology of Pseudobromus africanus (Hack.) Stapf.

By B. de Winter

CONTENTS. 1. Introduction.... 2. Description of the genus..... 3. Description of the South African Species.... 140 4. Anatomical Features of the South African Species..... 141 5. Cytology of the South African Species..... 142 6. Remarks.... 7. Material Examined..... 8. Distribution of the Species..... 144 9. Literature Cited..... 144

1. INTRODUCTION.

Pseudobromus africanus (Hack.) Stapf, the only indigenous species of the genus in South Africa, has until recently remained a most elusive and rare plant. For many years it was known only in herbaria from the type gathering made by Dr. A. Rehmann in the Northern Transvaal, sometime between 1875-1880. Within recent years, however, the species has been recorded from a number of additional localities in the southeastern parts of the Union.

Stapf (5) in 1900 considered the genus a close relative of the genus Festuca L. and consequently a representative of the Festuceae; later (6) he placed the genus near Bromus L. Phillips (7) during 1926 accommodated the genus without comment in the Agrostideae, whereas Camus (1) in 1930 supported Stapf's view both with regard to tribal and generic affinity.

Hence the present investigation was undertaken to throw further light on both its tribal and generic affinities.

In the course of this study a wide series of living and dried material was examined; the living plants were studied both in situ and in cultivation.

The present study is co-ordinated with others on South African Gramineae being undertaken by Dr. H. G. Schweickerdt (University of Pretoria) and Dr. B. S. Fisher

(Natal University College).

I wish to express my thanks especially to Dr. H. G. Schweikerdt for his guidance and encouragement in my studies (the present paper comprising part of the thesis presented in partial fulfilment for the degree of Master of Science at the University of Pretoria), to Mr. C. E. Hubbard of Kew for his valuable advice, and furthermore to the Directors and Curators of the various Herbaria who were kind enough to allow me to examine the relevant material.

2. DESCRIPTION OF THE GENUS.

PSEUDOBROMUS K. Schum.

Pseudobromus K. Schum. in Engler, Pflanzenwelt Ost. Afr., C, p. 108 (1895); Stapf in Dyer, Fl. Cap. VII., 763 (1900); Stent in Bothalia, I, 3, 278 (1924); Bews, World's Grasses, 201 (1929); Camus in Bull. Soc. Bot. France, 77 p. 511 (1930); Phillips, South African Grasses, 174, pl. 55 (1931).

Spikelets lanceolate, slightly compressed, peduncled, arranged in a panicle; rhachilla disarticulating above the glumes, produced and terminated by a reduced awned lemma. Florets 1 or 2, hermaphrodite, often with a superior (additional) rudimentary floret, the apex of which may project beyond the glumes. Glumes persistent, subequal, lanceolate to oblong, 1–3 nerved. Lemma narrowly lanceolate in profile, sub-herbaceous, rounded on the back, attenuated at the apex into a long straight awn; 3–5 nerved; margins incurved; callus very short, obtuse, glabrous. Palea subherbaceous, very narrow, two-keeled, entire or nearly so. Lodicules 2, hyaline, asymmetrical, unequally two-lobed. Stamens 3. Ovary oblong, pubescent at the apex; styles 2, usually fairly short, distinct, ending in slender plumose stigmas; stigmas laterally exserted. Caryopsis oblong, longitudinally channelled on the ventral face; not adhering to the lemma and the palea; hairy at the apex. Plants robust. Leaves flat, usually linear or narrow, herbaceous. Ligule membranous. Panicle large, lax and open, often nodding.

Species five: three in Madagascar, one in South Africa and one in tropical East Africa.

3. DESCRIPTION OF THE SOUTH AFRICAN SPECIES.

PSEUDOBROMUS AFRICANUS (Hack.) Stapf. (Fig. 1).

P. africanus (Hack.) Stapf in Dyer, Fl. Cap. VII, 763 (1900); Stent in Bothalia, 1, 3, 278 (1924); Bews, World's Grasses, Fig. 25, 201 (1929); Phillips, S. Afr. Grasses, 174, pl. 55 (1931).

Synonymy.—Brachyelytrum africanum Hackel in Bull. Herb. Boiss. III, 382 (1896).

Perennial, caespitose, branched from the base, rhizomes short and knotty. Culms few to many, erect or sharply ascending, up to four feet high, slender, simple. Internodes up to eight in number, glabrous, shiny, sometimes weakly striate, pallid to greenish. Nodes constricted, dark green to brown, striate. Sheaths tight, slightly longer than the internodes, open, strongly striate, nerves whitish, scabrous; margins thin, chartaceous. Ligule up to 8 mm. long, membranous, acuminate, glabrous; auricles glabrous; collar inconspicuous, smooth. Leaf-blade dark green, spreading or erect, sometimes more than 40 cm. long and 1.5 cm. wide, tapering into a setaceous point, narrowly lanceolate, flat on both surfaces, thick, more or less rigid, narrowed at the base; nerves on the upper surface scaberulous, less so abaxially; midrib prominent, four or five secondary nerves on each side of the mid-nerve; margins scabrid. Inflorescence a large, fine, lax, terminal, slightly nodding panicle, up to 40 cm. long; rhachis sometimes flattened, smooth below, scaberulous upwards, branches fascicled, terete, flexuous, spreading, fine, up to 20 cm. long, branched. Spikelets 7-9 mm. long, narrowly ovate in outline, awned, dark green, hairy at the base of the glumes, slightly laterally compressed or terete, disarticulating above the glumes. Floret 1, hermaphrodite; rhachilla scabrid, produced to a little more than half the length of the spikelet and bearing a terminal rudimentary lemma; the reduced empty lemma more or less developed, sometimes long-awned and the spikelet thus apparently two-flowered. Glumes up to 6 mm. long, herbaceous membranous, unequal, reaching to about one-half the length of the spikelet; the lower up to 5 mm. long, lanceolate, glabrous, one-nerved, margins hyaline; the upper broadly lanceolate, up to 6 mm. long, finely acuminate, margins hyaline threenerved, lateral nerves evanescent. Body of the lemma about 8 mm. long, a little shorter than the palea, narrowly lanceolate, margins hyaline near the base; midnerve produced into a long capillary awn; awn scabrid, about 20 mm. long. Palea narrowly lanceolate, up to 9 mm. long, herbaceous, strongly two-nerved, two-keeled with a narrow dorsal groove in which the produced rhachilla lies appressed. Callus rounded, hairy, gibbous in lateral view. Lodicules two, oblong, denticulate, swollen at the base, apex hyaline. Stamens three, more or less 6 mm. long, linear, pale yellow in colour. Ovary globose, hairy at the apex; styles two, very short; stigmas plumose. Caryopsis tightly enclosed by the lemma and the palea but not adhering, a little shorter than the palea, about

6 mm. long, bearing an apical tuft of hairs, reniform in cross-section; embryo small, about 1/6 the length of the grain; hilum linear stretching the whole length of the grain; epiblast present but small; starch grains compound, ovate- globose, consisting of many polyhedral granules. Reaction of KI₂ with starch normal, a deep blue colour.

4. ANATOMICAL FEATURES OF THE SOUTH AFRICAN SPECIES.

The Shoot (Fig. 2).

Shoot slender, long, circular in section, covered at the base with imbricate brown scales. Leaves arranged on a very short stem, young leaves protected by the sheaths of the outer leaves.

The anatomy of the stem conforms to the usual type. The stem is distinctly hollow. Two or three rows of vascular bundles lie near the periphery of the stem. The pith cavity is lined by thin-walled parenchymatous cells.

The *root* is typical of the monocotyledonous type. The endodermis cells are very strongly lignified, especially the inner tangential walls. Outer tangential walls only slightly thickened. The thickened walls show distinct striations and pits. An interesting point is that the pericycle cells are in some places thickened, and closely resemble endodermis cells.

The Leaf-blade (Fig. 4). Leaf Anatomy.

Hand cut sections made from the upper part of the lower third of a full-grown leaf were studied. Surface sections were used to study the epidermis. The study of macerated material of the blade proved useful in elucidating certain doubtful points. The drawings were made either with a Leitz Panphot or an Abbé drawing apparatus.

Abbreviations used in the text-figures are as follows:

11001012022		
LB. LS. IVB first 3VB third UE ada: LE aba: MC ST. P colourles	leaf-sheath. order bundle. order bundle. xial epidermis. xial epidermismotor cellstoma.	Cchlorenchyma. BSinner bundle sheath. Smechanical tissue or stereome. EClong tapering epidermal cell. OCone-celled curved hairs. RSconstricted part of chlorenchyma cell. ISintercellular spaces.

Leaf-blade tapering towards the margins, near the midrib about 0.39 mm. thick, near the margins about 0.18 mm, thick. Abaxial surface more or less flat; the adaxial finely grooved (vascular bundles slightly projecting). Keel prominent, rounded, with sides sloping. Epidermis (Figs. 3 and 4): Motor cells 3-5, poorly differentiated near the margins, otherwise large occupying $1/3-\frac{1}{4}$ the leaf thickness. No silicified cells present, cells very similar, long and narrow, tapering towards the ends. Stomata occurring on both surfaces; abaxially in 1-2 rows between the bundles, absent between some of the third order bundles; adaxially (Fig. 4) in 3-4 rows on both sides of the first and second order bundles and in 2-3 rows on both sides of the third order bundles. A single row of short one-celled curved hairs occur adjacent to the bundles ab- and adaxially. Longer one-celled straight epidermal hairs are found in the region of the stomata. Vascular bundles irregularly distributed. First order bundles 6-10 excluding the midvein; inner bundle sheath present and consisting of 16-22 lignified cells; outer bundle sheath consisting of a smaller number of fairly large thin-walled parenchymatous cells which contain some chloroplasts. Second order bundles up to 12 in number; inner bundle sheath consisting of 12-14 lignified cells; outer sheath of thin-walled parenchymatous cells. Third order bundles 14-17 in number; inner sheath consisting of about 10

lignified cells; outer of smaller number of parenchymatous cells. *Midrib* large, composed of a large first order bundle with adaxial and abaxial stereome strands, furthermore two second order bundles with their stereome strands; colourless, isodiametric parenchyma cells present as well as a few chlorenchyma cells. *Margin* tapering to a fairly narrow edge covered with small curved hairs. *Chlorenchyma* cells large, regular to irregular in places. Smaller round cells present between the chlorenchyma. The chlorenchyma cells in longitudinal view possess deeply undulating walls (Fig. 5C). If the section passes through the constricted part of a cell a small round cell is seen in the transverse section. Stereome weakly developed; present in the keel and above the mid-vein as well as abaxial to all bundles, but adaxial to first order bundles and usually all the third order bundles.

5. CYTOLOGY OF THE SOUTH AFRICAN SPECIES.

Origin of the Material.

The plants studied were gathered at Magoebaskloof, De Hoek. The type locality is given as Magoebaskloof Houtbosch.

Technique.

Only root tips were used. These were collected at about 10.30 a.m. and fixed in La Cours 2 B.P. fixative for 24 hours, dehydrated with xylol and embedded in wax with a melting point of 54° C. Sections were cut at 10–12 μ and stained by the iodinegentian violet technique described by La Cour (9).

The chromosome number was determined by making camera lucida drawings of several equatorial plates. Use was made of a stage micrometer to indicate the scale of the drawing.

Observations.

Pseudobromus africanus, 2n=28 (Fig. 6).

Basic number (probably)=7.

The chromosomes are of the relatively big festucoid type. The chromosome number corresponds with that of *Festuca* and *Bromus*, where many species with 2n=28 occur.

The length of the chromosomes vary from more or less 4 μ to more or less 10 μ . In the metaphase plates studied the bigger chromosomes lie on the periphery of the spindle, while the shorter ones occupy a more central position (Fig. 6).

6. REMARKS.

The genus *Pseudobromus* was created by K. Schumann (4) during 1895 on a plant which he described as *Pseudobromus silvaticus*.

On the basis of the one-flowered spikelet Schumann considered the genus to be related to *Deyeuxia* Beauv. of the *Agrostideae*, simultaneously pointing out certain differences. He furthermore mentions the superficial resemblance in facies of *P. silvaticus* and *Bromus asper* Murray, thereby indicating the source of the generic name *Pseudobromus*.

In the same year Hackel (3) described a species *Brachyelytrum africanum* which, however, differed from the genus, sensu stricto, in possessing spikelets with relatively large glumes and a lemma with a rounded, not oblique, callus. During 1900 Stapf (5) for sound reasons, transferred Hackel's species to the genus *Pseudobromus*, thus effecting the combination *P. africanus* (Hack.) Stapf.

Stapf (5) in 1900 evidently did not agree with Schumann concerning the generic relationship of *Pseudobromus*, since he states that the latter was closely allied to that of *Festuca L*. At a later date, however, he (6) places the genus *Pseudobromus* next to the

genus *Bromus* in his key to the genera of tropical African grasses. It must be assumed, however, that the position occupied by the genus *Pseudobromus* in the key referred to is one of convenience rather than one of natural affinity.

Phillips (7) places the genus under the *Agrostideae* without comment, in all probability merely following the arrangement of genera in De Dalle Torre and Harm's "Genera Siphonogamarum."

A. Camus (1), in her monographic account of the genus, supports Stapf's view (6) and furnishes a number of differential characters by which the genera *Bromus* and *Pseudobromus* may be readily distinguished. Her account includes the study of both African and Madagassian material comprising five species, resulting in an augmented and amplified conception of the genus, particularly with regard to the number of fertile florets per spikelet and the nature of the caryopsis.

Despite the above valuable contributions the difficulty still remains, viz., the close resemblance in facies and structure of members of *Pseudobromus* K. Schum. with certain species of *Festuca* L. The only tangible characters by which these genera may be distinguished in the case of *Pseudobromus*, appear to be the one- to two-flowered nature of the spikelet with an additional rudimentary lemma inserted on the produced rhachilla and the fewer nerved lemmas. This genus represents an extremely advanced type, which by the reduction of the upper florets could possibly have originated from a more primitive type, e.g., *Festuca* L.

Although the genus *Pseudobromus* resembles in facies certain species of *Bromus*, a number of fundamental differences are exhibited by these two genera, viz., *Bromus* possesses laterally compressed spikelets, which are several- to many-flowered; the keels of the palea are rigidly ciliate or ciliolate; the ovary is produced into a terminal appendage on which the styles are laterally inserted; the caryopsis usually adheres to the lemma and the palea; an epiblast is lacking in the embryo (2) and the starch grains are simple. All these characters are, however, not met with in the genus *Pseudobromus*, and for these reasons it is evident that the nearest ally of the genus in question appears to be that of *Festuca* L.

The anatomical study of the root, stem and leaf did not reveal striking characteristics. The endodermis of the root here and there appears to be two-layered, probably due to the pericycle cells with walls thickened in a way similar to those of the endodermis cells.

The chlorenchyma cells of the leaf in macerated condition reveal the presence of strongly undulating walls suggestive of rather conspicuous intercellular spaces; the latter are usually overlooked in transverse sections of the leaf.

7. MATERIAL EXAMINED.

All material cited was actually seen. The following abbreviations indicate the herbaria where the specimens are deposited:—

BOL	Bolus Herbarium, Cape Town.
CTM	South African Museum, Cape Town.
GRA	Albany Museum, Grahamstown.
NH	Natal Herbarium, Durban.
NU	Natal University College, Pietermaritzburg.
PRE	and the second of the second o
STELL	University of Stellenbosch.
UPR	University of Pretoria.

CAPE PROVINCE.—Tembuland Forests, V. 1919, R. Baur 491 (BOL, CTM). East Griqualand, Imsikini near Hoha, III., 1928, van Tonder 5 (PRE).

NATAL PROVINCE.—New Hanover district: Blinkwaterbos, kom in diep skadu voor, II., 1944, Schweickerdt 1534 (STELL, UPR). Lions River district: Karkloof Forest,

alt. 5,000', III., 1940, Ryecroft 45 (NH, PRE). Do., Karkloof Forest, common, V., 1940, B. S. Fisher 138 (NH). Do., Karkloof Forest, II., 1940, Ryecroft 3 (NH, NU). Zululand, N'kandla district: II., 1940, frequent in forest, alt. 5,000', Qudeni, Fisher et Schweickerdt 115, (NH, NU, PRE). Do., Qudeni, in shade in forest, alt. 5,000', II., 1940, Fisher et Schweickerdt 83 (NH, NU). Do., Qudeni, frequent in forests, alt. 5,000', II., 1940, Fisher et Schweickerdt 16 (NH, NU). N'Kalhlondla Forest, Cathedral Park Area, alt. 5,000', II., 1943, Schelpe 203 (NU).

Transvaal Province.—Pietersburg district: Haenertsburg, Houtbos, De Hoek, meerjarig, volop in bosse, Schweickerdt 1568 (UPR). Do., Haenertsburg, Houtbos, De Hoek, in die bosse, I., 1945, Schweickerdt 1563 (UPR). Letaba district: Houtbosch, 1875–1880, Rehmann 5732 (GRA) (type number); Do., Magoebaskloof, klam oop plekke in bos, IV., 1946, de Winter 104 (UPR). Do., Houtbosch, III., 1946, Schweickerdt 1601 (UPR). Do., Maripskop, IV., 1946, boonste bosse, nie volop nie, Schweickerdt 1616 (UPR). De Winter 129 and 271 (cultivated at University of Pretoria, cytologically investigated, PRE, UPR.)

Type Specimen (not examined).—Rehmann 5732, Houtbosch Letaba district, in Herb. Mus. Bot. Zurich.

8. DISTRIBUTION OF THE SOUTH AFRICAN SPECIES.

The distribution of this species is limited to the higher parts of the mistbelt forests which occur along the south-eastern and eastern escarpment. According to data obtained from herbarium sheets it does not occur below an altitude of about 4,000' above sea level (Fig. 7).

The distribution of the genus is apparently also limited to high altitudes of Africa and Madagascar. No gatherings have been reported under 4,000' for any of the species. *P. silvaticus* K. Schum. apparently reaches the high altitude of 8,000' in the East African tropics.

9. LITERATURE CITED.

- 1	CAMELIC	A	Tn	Rull	Sac	Rot	France	77	512	(1930)	

- 2. Kennedy, P. B..... The structure of the Caryopsis of Grasses with reference to their Mophology and Classification in Bull. 19, U.S. Dept. of Agric. (1889).
- 3. HACKEL, E..... In Bull. Herb. Boiss., 3, 382 (1895).
- 4. SCHUMANN, K,..... In Engler's Pflanzenwelt Ost. Afr. C., 180 (1895).
- 5. STAPF..... In Dyer, Fl. Cap. VII, 763 (1900).
- 6. STAPF..... In Prain, Fl. Trop. Afr., IX, I, 24 (1917).
- 7. PHILLIPS, E. P..... Gen. S. Afr. Flow. Plants (1926).

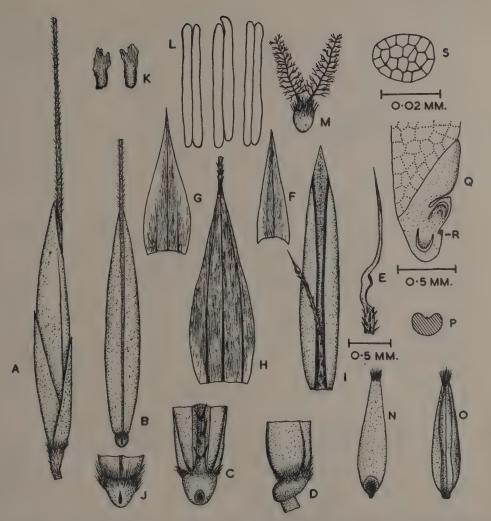


FIG. 1. A—Spikelet. B—Fertile floret, dorsal view. C—Base of floret, showing produced rhachilla and rounded callus. D—Side-view of the floret, showing the gibbous base and short rhachilla. E—Sterile reduced lemma inserted at the top of the produced rhachilla. F—Lower glume. G—Upper glume. H—Lemma, dorsal view. I—Palea with produced rhachilla. J—Callus. K—Lodicules. L—Anthers. M—Pistil. N—Caryopsis, dorsal view. O—Caryopsis, ventral view. P—Cross-section of the caryopsis. Q—Longitudinal section of the embryo. R—Epiblast. S—Compound starch grain.—(Schweickerdt 1534.)

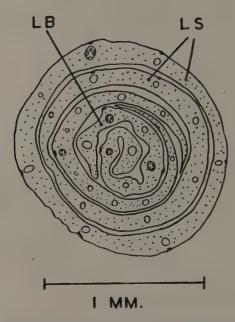


Fig. 2.—Cross-section of the shoot.—(Schweickerdt 1534.)

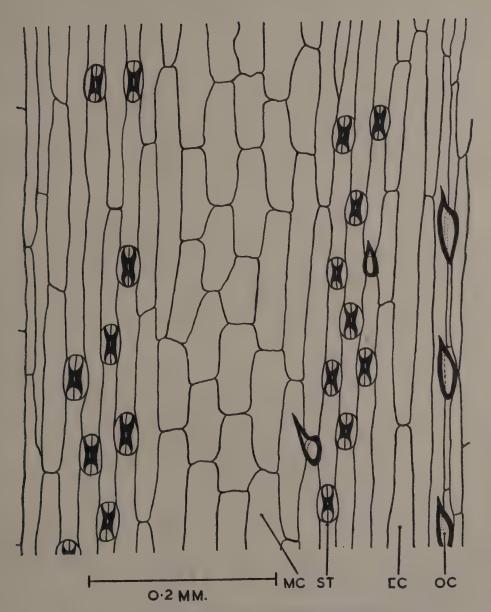


Fig. 3.—Abaxial epidermis.—(Schweickerdt 1534.)

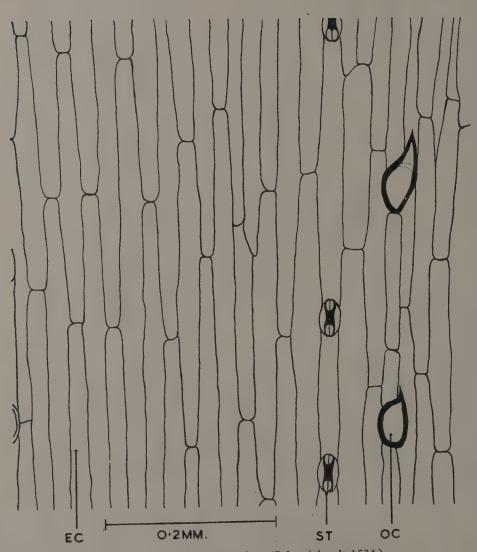


Fig. 4.—Adaxial epidermis.—(Schweickerdt 1534.)

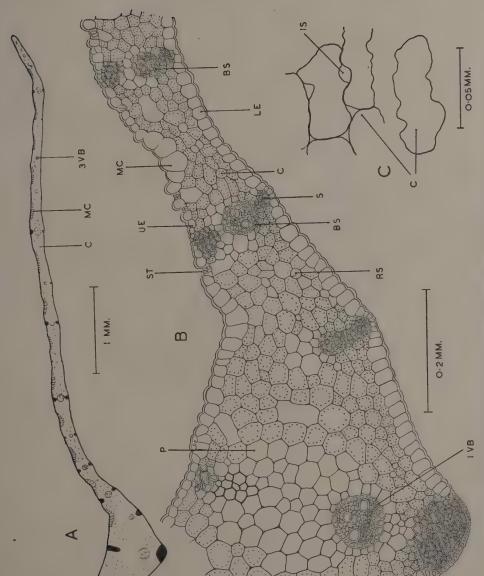


Fig. 5. 4—Diagrammatic drawing of the leaf. B—Drawing of a part of the leaf including the midrib. C—Macerated chlorenchyma tissue.

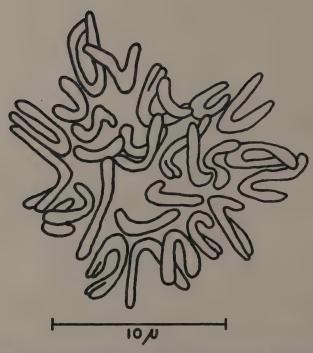


Fig. 6.—Polar view of a metaphase of a root tip cell.—(de Winter 129 and 271.)

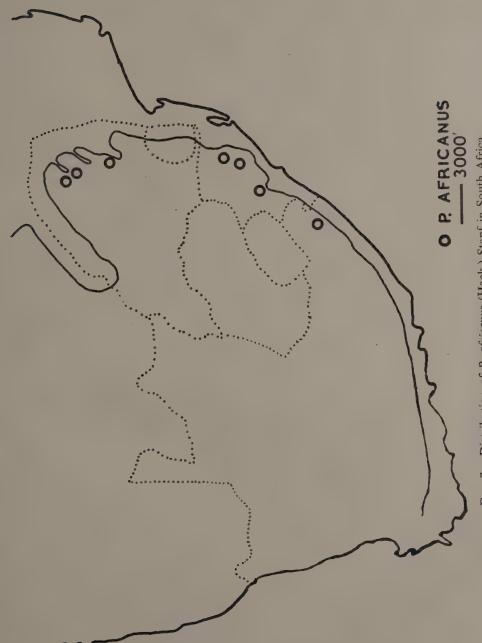


Fig. 7.—Distribution of P. africanus (Hack.) Stapf in South Africa.



South African Species of Acacia with Glandular Glutinous Pods.

By

I. C. Verdoorn.

During a recent survey of the Kruger National Park a species of Acacia was observed which is a common constituent of the vegetation in parts around Skukuza and Malelane. The endeavour to identify this Acacia led to a study of the group of species with glutinous or glandular pods, for its affinities were obviously with that group. It was found that it did not exactly match any of the existing species, and is therefore being described here for the first time and named A. exuvialis because of the peeling skin on the stem and branches.

At the time of this investigation the group as found in South Africa was comprised of four species and one variety. It became obvious, from this study, that as Burtt Davy suspected, his variety (A. permixta var. glabra) is as distinct as any of the species and is therefore here raised to specific rank and named Acacia tenuispina, because of its generally known common name "Fyndoring", meaning "slender spines."

It was also found that A. rogersii Burtt Davy from the northern Transvaal, north of the Zoutpansberg range, could not be upheld as distinct from A. nebrownii Burtt Davy, which was the new name given by Burtt Davy in the Kew Bulletin, 1921, for the S.W. African species A. glandulifera Schinz non Wats. Burtt Davy had only one specimen from Messina when he described A. rogersii and since then it has been collected repeatedly along the Limpopo River and in low-lying sites in dry bush country in the Messina and Dongola areas.

It is characterised in this group of species by the involucel being at the base of the peduncle and the leaves usually having only one pair of pinnae. Dr. L. E. Codd, Botanical Survey Officer, who knows the plant at Dongola, came across what seemed to him to be the same species when recently he travelled in S.W. Africa around Gobabis and southwards. On examination his specimens were also found to have the involucel at the base of the peduncle and the leaves with one pair of pinnae. In general his specimens compared very well with the Transvaal specimens. They also compared well with other collections from S.W. Africa, including three, Pearson 9256, 9814 and 8945, quoted by Burtt Davy under A. nebrownii in the Kew Bulletin, 1921.

It still remained to compare it with the type of the species. Acacia nebrownii being a new name for A. glandulifera Shinz (which name is antidated by A. glandulifera Wats.), the type must be one of the two S.W. African specimens on which Schinz based his species, Fleck 484a (flowering twig) from great Namaqualand, or Fleck 480a (fruiting twig) from Tsoaxaub, Hereroland. These specimens are in the Herbarium at Zurich. A member of our staff, Miss P. Kies, who had the opportunity of visiting Zurich, kindly examined these specimens and reported that they both had the distinguishing characters of the involucel and pinnae common to the other material.

The general description of the Zurich material also agrees well with the S.W. African and Dongola specimens already examined. It therefore appears that Acacia rogersii Burtt Davy cannot be upheld and must be sunk under Acacia nebrownii Burtt Davy.

Further study of the group confirmed Burtt Davy's decision to separate the rest of the South African material from A. nebrownii. He had at first (Kew Bull. 1921) cited specimens from Potgietersrust, Leydsdorp and Swaziland under this species, but in the Kew Bulletin 1922, he described A. permixta and its variety to include those

from the first locality and A. swazica those from the last mentioned. He did not account for the specimen from Leydsdorp which is unknown to us, but from the locality it is very unlikely that it is A. nebrownii.

The following key and the short account of each species given below summarises the present concept of the group in South Africa.

Mature pods torulose much curved, glutinous but glands not conspicuous:

Leaflets glandular-punctate with distinct glands usually on lower surface and on margins (giving margins a crenate appearance), average leaflet under 3 mm. long, rarely longer......

Mature pods flat only slightly curved, usually with numerous conspicuous, raised glands:

Branchlets and leaf-rachis pubescent with long hairs, branchlets densely so......3. A. permixta. Branchlets and leaf-rachis glabrous or nearly so:

Involucel midway on peduncle or higher:

1. A. borleae Burtt Davy in Kew Bull. 1922 (=A. barbertonensis Schweickerdt in Kew Bull. 1937).

Fig. 1.

Slender, gregarious trees or shrubs from 3–8 ft. tall, branching from near the base with slender ascending branches; obviously glutinous in parts, especially the long (up to 7 cm. by 3 mm.), much curved torulose pods. The leaves have up to six, rarely more, pairs of pinnae which are short, more or less $2 \cdot 5$ cm. long and the leaflets very small, about 2 mm. long. On the lower surface and margins of the leaflets are comparatively large glands, those on the margins giving a crenate appearance to the leaflet. As in other species of the group the straight, slender, white spines are a feature and the flowers are borne in small yellow, globose heads on axillary, slender peduncles more or less as long as the leaves. In this species the involucel is in the upper half of the peduncle.

- A. borleae occurs in low-lying sites in dry bushveld country from northern Zululand to Portuguese East Africa and Central Swaziland, with two widely spaced records from the Kruger National Park, one in the south about 14 miles N.E. of the Pretorius Kop Camp, in mixed bush on greyish sandy flats, and the other near Punda Maria in the extreme north of the Park.
- 2. A. exuvialis sp. nov. ab A. borleae foliolis marjoribus sine glandulis distinctis et ab A. swazicae leguminibus subtorulosis valde curvatis differt. Arbor parva, nonnunquam suffruticosa, caulibus ramisque gracilibus glutinosis cuticulis exutis. Spinae stipulares valde evolutae, strictae, albidae. Folia bipinnata usque ad 7 cm. longa; pinnae 1-6 jugatae, usque ad 3 cm. longae; foliola 3-6-juga, 3·5·7 mm. longa 2-3 mm. lata, mucronata, nerviis inconspicuis. Inflorescentia axillaris, capitata; pedunculi usque ad 3 cm. longi, supra medium involucrati. Flores lutei. Calyx 1·75 mm. longus, extus glaber, 5 lobatus; lobis dorso glandulosis. Corollae tubus 2·5 mm. longus, 5 lobatus; lobi 0·75 mm. longi, subacuti, recurvati. Stamina lutea, e tubo 2 mm. exserta. Legumen stipitatum, maturum valde curvatum, leviter torulosum, subplanum, usque ad 5 cm. longum, distincte venosum.

TRANSVAAL.—Nelspruit district: 16m. W. of Skukuza, Codd and Verdoorn 5464 (fruiting specimen) Type!; 4 m. W. of Skukuza Codd and Verdoorn 5467; 9½ miles S. of Skukuza, Codd and Verdoorn 5502; north banks Sabi River at Skukuza, Letty 30; near Malelane Camp, Codd 4359. Pilgrims Rest district: 7½ m. S. Olifants Bridge, Codd 1666. Zoutpansberg district: 3 m. N.W. of Shingwedzi Camp, Codd and de Winter 5569; 3½ m. N.W. of Shingwedzi Codd and de Winter 5568.

Characteristically this is a slender *tree* up to 15 ft. tall, the slender ascending branches becoming more and more branched towards the top, broomlike, and frequently seem too heavy for the slender stem, the whole tree eventually falling over. It also occurs in a *shrubby form* up to 8 ft. tall. The stems and branches are shiny glutinous in parts

and the thin skin peels off in strips or flakes which roll backwards.

The stipular spines are long, straight and ivory white, the leaves 1 6 pinnate and the *leaflets* usually in 3 to 6 pairs. The leaflets are from 3 5 -7 mm. long and 2-3 mm. broad, varying in shape from ovate oblong to obovate oblong, midrib oblique, apex obtuse or subobtuse, mucronate, the surfaces are microscopically grandular with minute immersed glands and rarely a few scattered stalked glands. The rachis is slender, flattened and slightly sulcate above and bears a prominent gland between the pinnae, it is terminated by a 1-4 mm. long very acute bract. The flower heads are yellow, axillary on slender peduncles up to 3 cm. long, bearing a pair of perfoliate involucral bracts about midway or higher up. In this character it is distinguished from A. nebrownii, which has the involucral bracts at or near the base of the peduncle.

The mature pods distinguish A. exuvialis from A. nebronwii, A. swazica and A. tenuispina in that they are somewhat torulose and strongly curved, without obvious glands on the surface while the others are flatter, only slightly curved with numerous

raised glands quite obvious on the flat surfaces.

In respect of pods the species described here resembles more nearly A. borleae which also has torulose strongly curved pods, but they are longer than in our species, up to 7 cm. long. The smaller leaflets with large glands, especially dorsally and on

the margins, giving a crenate effect, also help to distinguish A. borleae.

A. exuvialis is seen quite frequently in the Kruger National Park. In the southern part of the Park it occurs plentifully around Skukuza and Malelane in deciduous low-veld woodland on gritty, granitic slopes. Here it is characteristically a slender tree but in the northern part of the Park a shrubby form is found along the road from the Olifants to the Shingwedzi Rivers, growing in open Mopane veld. Here the plants grow in many-stemmed groups from 6-8 feet tall but, except for having more than one stem, they agree in all other respects with the typical plant described above.

3. A. permixta Burtt Davy in Kew Bull. 1922.

Fig. 3.

Small trees with a few weakly ascending branches which give it the popular name of "slap doring." It is distinguished in the group by having branches thickly covered with a long, whitish hairy pubescence. Like the related species it is generously provided with straight, rather long white spines and the leaves are short with only 2-4 pairs of short (1·5-2 cm. long) pinnae and up to 8 pairs of leaflets, which are about 3-5 mm. long with a distinct mucro. The petiole and rhachides are thinly hairy, and in this respect, and the leaflets often being ciliate, it also differs from the other species in this group. The inflorescence is globose, yellow, on axillary peduncles more or less as long as the leaves and with the involucel midway or higher on the peduncle. The pods are very flat and slightly curved, up to 4 cm. long and 1·4 cm. broad with sparsely scattered raised glands and prominent veins on the flat surfaces.

This species is found usually on sandy or gritty slopes derived from granite formations, chiefly along the edges of the Pietersburg plateau, where open grassland gives way to scattered thorn scrub. Here it is showing signs of spreading on overgrazed veld and is looked upon as a potential weed. Records of the species are noted from the Brits district and Sibasa area of the Zoutpansberg, both on weathered granite.

4. A. nebrownii Burtt Davy in Kew Bull. 1921 (=A. glandulifera Schinz non Wats. and A. rogersii Burtt Davy).

Fig. 4.

The slender free branching habit of this species and its gregarious nature result in the production of dense thickets up to 8 ft. high. It is distinguished in the group by the involucel being at or near the base of the peduncle. For the rest, except that the peduncles are usually shorter than in the other species and the leaves rarely with more than one pair of pinnae, it is typical of this group. It was indeed the first of these species to be described.

In the Transvaal A. nebrownii has been found only north of the Zoutpansberg, records being mainly from the Salt Pan and along the Limpopo River in the Messina-Dongola area. In S.W.A. it is quite widely spread and has been recorded from Bechuanaland. It grows characteristically in low-lying sites in dry bush country usually where silty soil has accumulated, as at watercourses.

5. Acacia tenuispina sp. nov. stat. nov. = A. permixta var. glabra Burtt Davy in Kew Bull. 1922, p. 330.

Fig. 5.

Transvaal.—Waterberg district: Naboomspruit, Galpin 475m. (type); 541 m. Potgietersrust district: farm Keron, Galpin 11597; nr. Villa Nora Acocks 8819; farm Somerset Estate, Pole Evans 3523. Pretoria district: Pretoria North, Smith 6170.

When describing the above variety Burtt Davy wrote: "This may prove to be a distinct species when more complete material is available." Our present knowledge of the glandular-pod species of Acacia shows that this plant is as distinct from A. permixta as are any of the other species in the group. The specific epithet was suggested by the generally used common name "Fyn doring" describing the slender thorns with which the plants bristle. The species is characterised by its stoloniferous habit forming large clumps or colonies, usually in turfy ground. It is usually low growing, 2-3 ft. high, but may grow taller, up to 6 ft., according to some records. Besides the differences of the glabrous branches and narrower pods, this growth habit clearly distinguishes it from A. permixta which occurs as a small tree about 6 ft. tall. In some respects it is nearer A. nebrownii and A. swazica but can be distinguished from both in the smaller leaflets and narrower pods. From A. nebrownii it also differs in having the involucel about midway on the peduncle and not at or near the base, as in the former. A. exuvialis is easily distinguished from it by the habit, being a slender tree, and by the torulose much curved pods, those of A. tenuispina being linear and only slightly curved.

6. A. swazica Burtt Davy in Kew Bull. 1922.

Fig. 6.

Small trees, rather stout as compared with the others in this group, with short ascending branches. It is distributed mainly in the Barberton and Nelspruit districts, where it grows in dry, bush-covered slopes and hillsides, usually in rocky situations. Specimens from Swaziland are easily distinguished by the leaflets being larger than in the other species, up to 1 cm. long, and with conspicuous veins. From further north, however, where the distribution overlaps with that of A. exuvialis as it does near Malelane, the leaflets are not quite so large and the veins often not conspicuous. It is, however, distinguished from A. exuvialis in the pods being flat, up to 1 cm. broad, somewhat curved and with scattered raised glands on the flat surfaces, as against the much curved, sub-torulose pods, without raised glands of A. exuvialis.

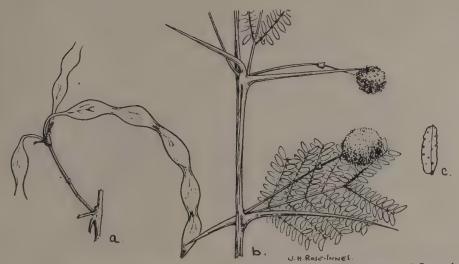


Fig. 1.—Acacia borleae Burtt Davy: a, fruiting inflorescence; b, portion of flowering twig; c, leaflet, \times 3.

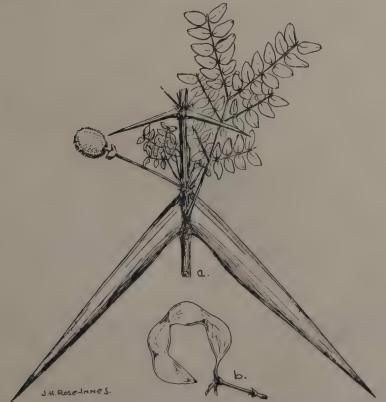


Fig. 2.—Acacia exuvialis Verdoorn: a, portion of flowering twig; b, fruiting inflorescence.

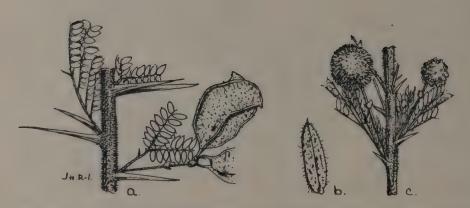


Fig. 3.—Acacia permixta Burtt Davy: a, portion of fruiting twig; b, leaflet, \times 5; c, portion of flowering twig.



Fig. 4.—Acacia nebrownii Burtt Davy: a, portion of flowering twig; b, leaflet, \times 3; c, portion of fruiting inflorescence.

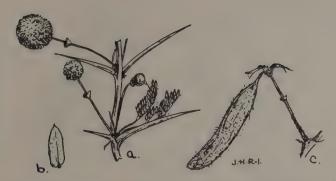


Fig. 5.—Acacia tenuispina Verdoorn: a, portion of flowering twig; b, leaflet, \times 3; c, portion of fruiting inflorescence.

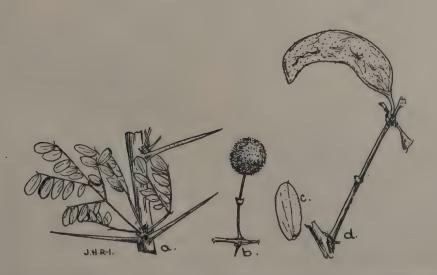
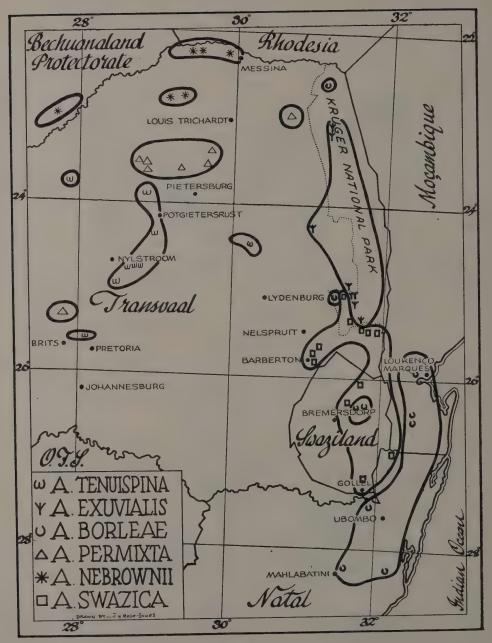


Fig. 6.—Acacia swazica Burtt Davy: a, portion of leafy twig; b, inflorescence; c, leaflet \times 3; d, portion of fruiting twig.



Distribution Map. (Drawn by J. H. Rose Innes).

Revision of the Genus Cyclopia and Notes on Some Other Sources of Bush Tea.

By P. Kies.

The leaves and flowers of most of the Cyclopias have been used as tea for many years in the districts where they occur, and lately "bush tea" has become a marketable commodity in wider circles since the great rise in price of Ceylon tea. A revision of the relative nomenclature has become an urgent necessity. Hofmeyr and Phillips in Bothalia 106 (1922) give a summary of the commercial varieties of these tea plants, and, allowing for nomenclature alterations, in general their scheme still holds good.

The genus occurs in the coastal districts of the Cape Province, from Clanwilliam to Port Elizabeth, being bounded in the north by the mountain ranges—Koue Bokkeveld Mountains, Klein Swartberg, Groot Swartberg and Kouga Mountains, and the species

seem to be fairly localised.

The earliest mention in botanical literature of one of these plants was an illustration in Pluk. Phyt. 4: t. 413, fig. 5 (1705) under the title "Genista rosmarinifolio triphyllos Promont, Bonae Spei". This figure was cited by later authors under various synonyms until it was eventually placed under Cyclopia genistoides by De Candolle, Prod 2: (1825). On the same plate of Pluk. Phyt., Fig. 4, is a drawing of a species of Aspalathus which has repeatedly been misquoted by earlier authors under C. galioides, but Vogel in Linnaea X (1836) 595, put a stop to this error. A similar error has persisted with regard to the identity of Gompholobium maculatum Andr. Bot. Rep. pl. 427, VI (1803). The name was sunk under Ibbetsonia genistoides Sims, in Bot. Mag. t. 1259 (1810), although the drawings clearly indicate the calyx and bracts in both, and the former is without doubt identical with C. tenuifolia Lehm., Linnaea 5: 373 (1830).

The century-old argument about the priority of Ecklon and Zeyher over Ernst Meyer was settled in Journ. Soc. Bibliogr. Nat. Hist. 1, 4: 101–103 (1937), so that the

nomenclature changes here are made accordingly.

Although the generic characters of *Cyclopia* are very well defined, the specific characters show a great variability and in various stages of development the branches on one individual plant appear, when detached, to be specifically distinct. Systematists have not been able to agree on the exact limits of each species or variety, and have regarded species as varieties or vice versa. The present work is an attempt at finding some stable characters for the classification of the species.

The leaf-shape varies considerably on individual plants, from terete to flattened; the pubescence is very often entirely lost in the mature state of the branches, or persists only as axillary tufts of hairs. The length of the pedicel varies with external conditions or with the age of the flower, and in the fruit it is usually thickened. There are also minute stipules on some leaves, but they are not constant, being absent from other leaves on the same branch, or being replaced by additional leaflets as in *C. plicata*. Even the number of bracts is not constant in *C. burtonii*, being either two or three on the same specimen. The shape of the calyx varies with age; in the bud the actual shape is more easily distinguished than in an open flower, where the retroflection of the calyx has occurred. The lower lobe is usually falcate, keeled and longer than the upper four lobes, so that it is not of characteristic shape at all. Even in the petals there are variations. In *C. meyeriana* the standard may be very clearly apiculate, or just minutely mucronate, and in *C. genistoides* there is in some forms a small auricle at the lower edge of the wing, which may be reduced or lacking on other flowers of the same plant.

The actual size and shape of the bracts and calyx seem to be constant, and together with the texture of the leaves they have made some scheme of classification possible.

CYCLOPIA VENT.

Shrubs, leaves ternate, usually exstipulate, leaflets linear to ovate, margins often revolute, sessile or shortly stalked. Flowers solitary, axillary, stalked or sessile, with 2 or 3 bracts at base of peduncle. Calyx intruse at base, five fid, lowest lobe carinate, upper lobes adpressed to vexillum. Vexillum suborbicular to oblong, plaited at base, shortly clawed, with or without dark centre. Alae oblong with a transverse fold, clawed. Carina obtusely rostrate, clawed. Stamens 10, free or slightly connate at base. Style arcuate. Legume oblong, coriaceous, several seeded.

See figures 1—20 (b) and distribution map.

KEY TO CYCLOPIA SPECIES.

- A. Stem densely hairy when young, may become glabrous with age, and tufts of hair persist only in leaf axils; leaves at first hairy becoming glabrous:
 - I. Flowers pedicelled, bracts not clasping base of calyx:
 - A. Bracts not plicate:
 - a) Bracts and calyx villous on outer surface, leaflets terete, calyx lobes lanceolate

1. C. bolusii

b) Bracts and calyx villous on inside, subglabrous outside; leaflets at first hairy, becoming glabrous, golden, terete to lanceolate; calyx lobes lanceolate

3. C. aurescens

- c) Bracts pubescent inside, calyx glabrous both sides, leaflets terete, calyx lobes lanceolate falcate, acute and apiculate:
- B. Bracts plicate, apex recurved:
 - a) Bracts and calyx pubescent outside, calyx ribbed, lobes acuminate

6. C. pubescens

b) Bracts and calyx pubescent inside, calyx lobes obtuse, pedicel pubescent

14. C. plicata

- II. Flowers subsessile, bracts large, ovate, clasping calyx:
 - a) Bracts ciliate or villous on margins, calyx hairy on inside and on margins:
 - i. Bracts persistently villous on inner surface, calyx lobes ovate, obtuse, glabrous outside
 2. C. bowieana
 - ii. Bracts glabrous inside, calyx lobes acute, hairy on outer surface

7. C. meyeriana

- b) Bracts glabrous on margins and outer surface, calyx becoming glabrous on inner surface:
 - i. Calyx villous on margin and outer surface, bracts glabrous inside

8. C. montana

ii. Calyx glabrous outside, ciliate on margin, bracts pubescent on keel inside

8. C. montana var. glabra

- B. Stem glabrous or minutely pubescent when young, leaves generally glabrous:
 - I. Leaves terete or subterete by rolling in of margins:
 - a) Calyx lobes short, straight, deltoid, pubescent within:
 - . b) Calyx lobes lanceolate, falcate, long, pubescent on margins, or glabrous, leaves reflexed when mature:

 - ii. Leaves lanceolate, margins incompletely inrolled 10. C. genistoides var. heterophylla

II. Leaves flat, margins sometimes inrolled:
a) Bracts 2 or 3 on same plant, flowers small, bracts and calyx acute11. C. burtonii
b) Bracts always 2:
i. Bracts obtuse with a reflexed mucro:
 O Plant slender, pedicels filiform, leaves linear, lanceolate12. C. filiformis O Plant stouter, leaves elongate, spathulate to linear, bracts ribbed slightly 13. C. longifolia
ii. Bracts acute or obtuse, without reflexed apex: 0 Bracts large, subequal to pedicel, 6-9 mm. long, acuminate, calyx lobes long, acute, falcate or subfalcate, leaves elliptic, lanceolate or linear, coriaceous, glaucous
00 Bracts medium to small, shorter than pedicel:
X Leaves short, ovate, obtuse at apex, bracts $0.4-0.6$ cm. long:
1. Leaves cordate or truncate at base, distinctly marked with veins on undersurface. Calvx lobes acute16. C. buxifolia
2. Leaves obtuse or acute at base, subcoriaceous, calyx lobes falcate, lanceolate, acute, leaf margin crisped somewhat 15. C. falcata var. ovata
3. Leaves ovate to terete on same plant 10. C. genistoides var. ovalifolia
XX Leaves linear, lanceolate or spathulate:
Bracts sub-truncate, coriaceous, plant with a golden sheen when dried, calyx lobes short, deltoid, convex on back:
2. Bracts acute, subcoriaceous:
△ Leaves golden sheen when dried, subteretely rolled to linear- lanceolate, calyx glaucous, short deltoid 3. C. aurescens var. glauca
△ Calyx lobes lanceolate, falcate, long, acute, leaves becoming reflexed
Leaves elliptic-lanceolate, acute at base and apex, veined on undersurface, margins inrolled, calyx acute, bracts shorter than pedicels18. C. dregeana
☐☐ Leaves linear to spathulate, obtuse at apex, or subacute, narrowing towards base, slightly veined, subcoriaceous, calyx lobes short, obtuse, bracts small:
+ Pedicels short, stout, 2-3 mm. long, may elongate in fruit, bracts clasping pedicels, 2-3 mm. long, leaves linear to elliptic, veined

1. C. bolusii Hofm. and Phill. Both. 1:109 (1922).

Small shrub; stem at first hairy, becoming glabrous; bark breaking off in squares; leaf-bases prominent; leaflets at first hirsute, becoming glabrous, ericoid, subclavate, obtuse, sulcate below, reflexed or ascending, curved or straight, laxly arranged, 5-7 mm. long; flowers few, pedicel present; bracts lanceolate, hairy outside, keeled and sulcate on either side of keel, as long as pedicel (5 mm.); calyx lobes lanceolate, subfalcate, acute to obtuse, hirsute on outer surface, ciliate on margins, subglabrous within.

++ Pedicels elongated, bracts acute, much shorter than pedicels, leaves attenuate at base, much smaller on axillary

20. C. subternata

20. C. subternata var. laxiflora

branchlets, not veined, leaflets cuneate.

+++ Leaflets narrow-linear spathulate

Prince Albert Division: Swartberg Pass, Bolus 11465 (type); Klein Swartberg, Andreae 1250.

2. C. bowieana Harv. Fl. Cap. 2: 9 (1862) "Vleitee." C. ashtonii Hofm. and Phill. 1.c.

Small shrub, branches at first silky, becoming glabrous with tufts of hair persisting in leaf axils; stem and leaves with a golden sheen when dried; leaflets from a thick flattened node, up to 1.75 cm. long, 7 mm. broad, cordate at base, flattened or margins, revolute and leaflets subterete, sulcate and pale glaucous grey on undersurface; bracts 4–8 mm. long, broadly ovate, ciliate, villous inside, glabrous externally; calyx 8 mm. long, lobes ovate, obtuse, long ciliate on margins, hairy inside, glabrous externally; flowers subsessile; calyx clasped at base by bracts.

No locality: Bowie (type in Kew Herb.). Swellendam Division: Burchell 7350; Grootvadersbos, Ashton 2843; Lemoenshoek, Esterhuysen 10444, George Division: Burchell 5893.

3. C. aurescens sp. nov.

Nearest C. bolusii, but calyx sub-glabrous and leaves somewhat flattened.

Shrub up to 75 cm. high; stem and leaves at first shortly hairy, becoming glabrous, with a golden sheen when dried; stem ribbed and angled with prominent leaf bases; leaflets thickly coriaceous, mucronate subterete and sulcate, becoming flattened, with only margins slightly revolute; the upper surface shiny golden, undersurface dull, glaucous; bracts sparsely pubescent outside, becoming glabrous, hairy inside and on margins, 5-6 mm. long, ovate, acute, mucronate, coriaceous in fruit, shorter or subequal to pedicel; calyx lobes 4 mm. long, lanceolate obtuse, subfalcate, convex, keeled, pubescent inside and on margin, outside at first hairy, becoming glabrous. Var. glauca: differs from type, being glabrous, and calyx lobes shortly deltoid, glaucous.

Fruticulus erectus, 75 cm. altus. Rami aurei, costati; juniores puberuli. Foliola 2·5 cm. longa, supra aurea, subtus glauca, coriacea, mucronata; juniora teretia, seniora lanceolata, marginibus revolutis. Bracteae 5-6 mm. longae, ovatae, acutae, mucronatae, extus glabrae, intus villosae, margine puberulae, pedicellis subaequales. Calycis lobi 4 mm. longi, lanceolati, subfalcati, obtusi, dorso rotundati, intus pubescentes, extus glabrescentes. Fructus lanceolatum, obliquum.

Var. glauca a typo ramis glabris lobis calycis deltoideis glaucis differt.

Riversdale Division: Garcias Pass, *Bolus* 11249. Ladismith Division: Swartberg, *Marloth* 3988. Laingsburg Division: Witteberg, *Compton* 2801. Prince Albert Division: Swartberg, *Andreae* 1255; *Pocock* S144; *Stokoe* 9024; Sewe Weeks Poort, *Primos* 33, *Stokoe* 1919. Var. glauca Ceres Division: Bolus Herb. 15447; Koue Bokkeveld, *Schlechter* 8922. No locality: *Pappe*, Herb. Hook.

4. C. galioides (Berg.) D.C. Prod. 2: 101 (1825).

Sophora galioides Berg. Cap. 141 (1767); Sophora genistoides Thb. var. 3, Prod. (1794); Podalyria genistoides Willd. Sp. Pl. (1799) partly; Galega genistoides Thb. var. B, Fl. Cap. (1806); Cyclopia genistoides Walp. in Linnaea 13 (1839) partly; C. galioides E. and Z. Enum. (1826); E. Mey. Comment. 1 (1836); Vogel in Linnaea 10 (1836); Benth. Ann. Mus. Vind. 2 (1839); Benth. in Hook. Lond. Journ. Bot. (1843); Harv. l.c.; Hofm. and Phill. l.c.

Stout shrub; branches angular with prominent leafbases, at first densely villous with greyish hairs, glabrous with age, bark purplish; leaflets up to $2 \cdot 5$ cm. long, at first hairy, becoming glabrous, sessile, subterete, sulcate beneath, stout, straight, close together on stem or somewhat lax, apex mucronate, ascending; bracts 4-8 mm. long, acuminate, ovate to lanceolate, as long as the pedicel or exceeding it, glabrous outside, puberulous inside; pedicels short, glabrous; calyx glabrous; lobes lanceolate falcate, acuminate, apiculate, flowers in springtime.

No locality: Scholl in Herb. Mus. Vind. (1836); Grey, Herb. Kew., Cape Peninsula; Vlaggeberg, Schlechter 459; Table Mountain, Flanagan 2414; Devils' Peak, Alexander, (1847); Muyzenberg, Burke and Zeyher; Kalk Bay, Alexander (1846); Vis Hoek, Bolus 67: Simonstown, Jameson (1841); Wright; Compton; Pillans 3039.

5. C. capensis Salter in Journ. S.A. Bot. 5 (1939).

An erect shrub, 30-50 cm. high, rarely 1.5 metres high; branches virgate, ascending, at first leafy and sparsely grey villous, becoming nude and glabrous and light brown; petioles 1 mm. long, pilose in the axils; leaflets slender, linear terete, curved, mucronate, pilose at first, becoming glabrous, 1-1.5 cm. long, canaliculate below; flowers congested towards apex of branches pedicel 4-7 mm. long; bracts 5-8 mm. long, glabrous on both surfaces, ovate-lanceolate, acute; calyx lobes, broadly lanceolate, falcate, apiculate, 6 mm. long; carina minutely cuspidate, emarginate at apex; flowers in late summer.

CAPE PENINSULA: Table Mountain, Wolley-Dodd 875; Wynberg, Esterhuysen 12643; Paulsberg, Salter 8035, 8036; Compton; Kommetjie, Galpin 12694; Smitswinkel, Salter 8034; False Bay, Alexander (1846); Simon's Bay, Alexander (1846); Bright Water, Leighton 1616.

6. C. pubescens E. and Z. l.c.

Vog. in Linnaea 10 (1836); Walp. l.c. Benth l.c.; Harv. l.c.; Phill and Hofm. l.c.

Plant pubescent; leaflets linear, obtuse, mucronate, margins slightly revolute, midrib prominent below, thinly pubescent to glabrous, up to 2.5 cm. long; bracts wrinkled longitudinally, apex acuminate recurved, pubescent in and outside or subglabrous; flowers pedunculate, pedicel 1.5-1.8 cm. long, calyx pubescent both in and outside, distinctly nerved, lobes 0.6 cm. long, acuminate from a deltoid base.

Port Elizabeth Division: Ecklon and Zeyher 1146; Van Staaden's River, Bolus 1604 (partly).

7. C. meyeriana Walp. l.c.

C. sessiliflora E. Mey, non E. and Z. l.c.; Benth. l.c.; Harv. l.c.

Stem at first densely villous, becoming glabrous; leaves crowded, persistently hairy in the axils; leaflets pilose, becoming glabrous with age, slender, terete, sulcate below; flowers sessile, crowded towards apex of branches; bracts broadly ovate, clasping base of calyx, acuminate, 6–8 mm. long, shiny, glabrous, villous on margins; calyx villous on margin, deciduously hairy on outside and inside, lobes lanceolate, straight; standard usually clearly apiculate.

No locality: Drege (1836). Somerset West Division: Hottentots Holland, Stokoe 13/11/34; 7/11/38. Paarl Division: Drakenstein, Drege; Du Toits Kloof, Drege. Worcester Division: Wilde Pardeberg, Stokoe 1055; Baviaans Kloof, Leighton 1357. Caledon Division: Genadendal, Burchell 7770; Schlechter 9826; Landdroskop, Stokoe

7813. Esterhuysen 2636.

8. C. montana Hofm. and Phill. 1.c.

Stem and leaves laxly silky haired; stem angled to subterete, bark reddish, with a golden sheen when dried; leaves with a tuft of hairs persisting at the base, laxly arranged; leaflets narrowly terete, cordate at base; flowers subsessile towards apex of branches; bracts 4-6 mm. long, broadly ovate, acute, clasping calyx at base, glabrous in and outside; lobes of calyx 5-7 mm. long, lanceolate, acute, straight, becoming glabrous, at first densely long hairy inside, outside and on margins, standard not distinctly apiculate. Differs from *C. meyeriana* by *glabrous* bracts.

Var. glabra Hofm. and Phill. l.c., has calyx glabrous, ciliate on margins, petals

large and pale yellow.

Ceres Division: Ertjies Kloof, Compton 16087. Worcester Division: Witteberg, Esterhuysen 9466, 8677. Tulbagh Division: Winterhoek, Phillips 11131. Var. glabra Ceres Division: Conical Peak, Stokoe 7814, 7815. Worcester Division: Hex River, Esterhuysen 9364, 9369, 8707; Waaihoek, Esterhuysen 9932, Pells 15/12/38; Fonteintjiesberg, Esterhuysen 8767; Brandwag, Esterhuysen 11012; Matroosberg, Marloth 2277, 2370, Esterhuysen 14221.

9. C. maculata (Andr.) comb. nov. "Vleitee."

Gompholobium maculatum Andr. Bot. Rep. 6:427 (1803); Cyclopia tenuifolia Lehm. in Linnaea 5 (1830) 373; Benth. l.c.; E. and Z. l.c.; Harv. l.c.; Hofm. and Phill. l.c.; C. laricina E. Mey. l.c.

Shrub 60-90 cm. high, glabrous, with ribbed branches; leaflets linear filiform or lanceolate, 2-3·5 cm. long, acute, margins inrolled, sulcate or open backed; pedicels up to 1 cm. long, in fruit 1·5 cm. and much thickened; bracts truncate, obtuse, coriaceous, thickened with age, keeled, sparsely hairy within, 3-5 mm. long, broader than long; calyx lobes 3 mm. long, ovate-lanceolate, obtuse, glabrous with margins pubescent, uninerved; vexillum of a deeper colour above the claw; legume oblong, coriaceous.

No locality: Zeyher in Nl. H. 25099; E. and Z. in Nl. H. 10019; "with Wieb 47" in Herb. Kew. Worcester Division: Chavonnesberg, *Esterhuysen* 8205. Paarl Division: Bainskloof, *van Breda* 76. Stellenbosch Division: Eerste Rivier, Herb. Hook. Nov. 1840; French Hoek, *Bolus* 6980. Somerset West Division: Hottentots Holland, *Alexander* (1846). Caledon Division: Elgin, *F.D.H.* 2840. Swellendam Division: Storm Valley, *Zeyher* 2257; Rivier-Sonder-End, *E.* and *Z.* 1150; in N.H. 24359; Grootvadersbos, *F. D. H.* 3750; *Burchell* 7522. Riversdale, Corente River, *Muir* 59.

10. C. genistoides (L.) R. Br. Hort. Kew 3: 5 (1811) "Heuningtee."

Sophora genistoides Linn. Sp. Pl. Tom. I Ed. III (1764); Berg. l.c.; Burm. Fl. Cap. Prod. (1768); Thb. Prod. Pl. Cap. (1794); Podalyria genistoides Willd. l.c.; Galega genistoides Thb. d, Prod. Pl. Cap. 2: 192 (1800). Ibbetsonia genistoides Sims. Bot. Mag. 1259 (1810); Cyclopia genistoides E. Mey. l.c.; E. and Z. l.c.; Benth. l.c.; C. galioides E. Mey. l.c.; C. teretifolia E. and Z. l.c.; var. linearifolia E. and Z. l.c.

Shrub with branches ribbed, becoming terete, glabrous, or puberulous, erect, nude at base, leafy above; leaves dense, shorter or longer than internodes, reflexed when mature; leaflets ovate or linear, subterete or open backed with margins incompletely rolled in, 0.5-3.5 cm. long, obtuse, glabrous; pedicel 0.5-1.5 cm. long, flowers crowded at apex of branches; bracts ovate, acute, glabrous outside, pubescent inside, 5-7 mm. long, usually shorter than pedicel; calyx lobes lanceolate, falcate, acuminate, 4-6 mm. long, glabrous or puberulous on margins; fruit lanceolate; wings sometimes auricled on lower margin, just above claw.

Var. heterophylla Harv. l.c.: Leaflets terete to lanceolate, margins incompletely inrolled. C. heterophylla E. and Z. l.c.

Var. teretifolia (E. and Z.) comb. nov.: leaflets slender, curved, short. C. teretifolia E. and Z. l.c.

Var. ovalifolia var. nov.: leaflets subterete to flattened, ovate; small shrub, flowers long stalked.

Var. ovalifolia var. nov.: suffrutex humilis, foliolis ovatis vel subteretibus floribus pedicellatis.

No locality: E. and Z. in N.H. 10018; Siebert 47; Herb. Harv. 745; Zeyher 353; Drege (1876); Burchell 417; Pappe 9, Herb. Hook.

Malmesbury Division: Groenkloof, Drege, N.H. 24347, 24289; Bokbaai, Esterhuysen 3829. Worcester Division: Stettynsberg, Esterhuysen 11100; Du Toits' Peak, Esterhuysen 8568. Paarl Division: Wemmershoek, Marloth 819, Esterhuysen 9667, 11277;

Fransch Hoek, Stokoe; Herb. Harv. 770. Cape Peninsula: Wynberg, Bolus 7272B; Kirstenbosch, Esterhuysen 11842, Hutchinson 29, MacOwan 76; Devils Peak, Wolley-Dodd 1320; Hout Bay, Marloth 280; Alexander (1846); Simon's Bay, Wright 9/657; Wolley-Dodd 1328. Stellenbosch Division: Burchell 8320; De Jongh, 4390; Guardian Peak, Esterhuysen 11984. Somerset West Division: Hottentots Holland Mountains, Stokoe; Alexander (1846); Sir Lowry's Pass, Hutchinson 336. Caledon Division: Elgin, Hubbard 473, F.D.H. 2842; Bolus; Zeyher (1865); Kleinriviersberg, Zeyher in N.H. 11833, Esterhuysen 2915; Table Mountain, Marloth 6046; Kogelberg, Stokoe 1015. Bredasdorp Division: Potberg, Pillans 9473, 9328, 9500. Swellendam Division: Elandspad, Pillans 9406. Var. heterophylla: Swellendam Division: Rivier-Sonder-End, E. and Z. 1148, Stokoe 9004. Var. teretifolia: Caledon Division: Sneeukop, Esterhuysen 2635. Uniondale Division: Mannetjiesberg, Esterhuysen 6469.

11. C. burtonii Hofm. and Phill. l.c., "Heuningtee," "Suikertee".

A small much-branched shrub, 30–41 cm. high, with leaves, flowers and fruits smaller than the average size for the genus; leaflets lanceolate, flat or channelled below, acute, 0·6–1·2 cm. long, 2 mm. broad, coriaceous; bracts 2 or 3 on the same branch, two bracts at base of pedicel, and a smaller one adnate to pedicel, acute, 1–2 mm. long, lanceolate; pedicel 1–2 mm. long; calyx lobes acuminate, 1–2 mm. long, ovate, pubescent on margins; vexillum 8·5 mm. long, 6 mm. broad, acute; alae narrowly oblong; carina obtusely rostrate.

Oudtshoorn Division: Swartberg, *Burton* in F.D.H. 2914. Prince Albert Division: Swartberg, *Minnaar* 5, *Stokoe* 9020.

12. C. filiformis sp. nov.

Small shrub, stem terete, bark glaucous, purplish when dried; leaflets up to 2 cm. long, linear lanceolate, margins slightly reflexed, midrib prominent below, apex obtuse, membranous, ascending or reflexed when mature; flowers lateral in leaf axils, smaller than in the average size for the genus; bracts 2–3 mm. long, subtruncate, apex reflexed, mucronate, keeled; pedicels filiform up to 8 mm. long; calyx lobes deltoid, acute, 1·5 mm. long, exceeding the tube; standard ovate-lanceolate; wings narrowly oblong, claw 1·5 mm. long, blade 9 mm. long; carina obtuse, as long as wings; legume lanceolate, small; style persistent; flowers appear in November.

Fruticulus 20 cm. altus. Rami teretes, glabri, glauci. Foliola ascendentia deinde reflexa, membranacea, 2 cm. longa, lineari-lanceolata, apice obtusa, marginibus revolutis nerviis subtus prominentibus. Bracteae 2–3 mm. longae, subtruncatae carinatae, glabrae, apice emarginatae. Flores laterales, pedicellis filiformibus 8 mm. longis. Calycis lobi deltoidei, acuti. Vexillum ovato-lanceolatum. Alae oblongae, unguiculatae. Carina obtusa, unguiculata, usque 9 mm. longam. Legumen parvum, lanceolatum, stylo persistente.

Port Elizabeth Division: Van Staadensrivier, MacOwan 336/A.K.

13. C. longifolia Vog. in Linnaea 10: 595 (1836); Walp l.c.; Benth. l.c.; Harv. l.c.

Glabrous shrub, branchlets angled; leaflets subcoriaceous, oblong, linear, attenuate at base, obtuse at apex, 3.5 cm. long or more, flat with extreme edges revolute, dark green above, paler below, midrib prominent below; pedicel exceeding bracts; bracts ovate oblong, plicate-striate, apex recurved, 0.4 cm. long; calyx lobes acute, short, 3 mm. long; petals 9 mm. long.

No locality; Mundt and Maire in Kew Herb.; ex Hort. Reg. Berol. Port Elizabeth Division: Van Staadens, Bolus 1604 (partly).

14. C. plicata sp. nov.

Stem pubescent becoming glabrous, ribbed, with leafbases prominent, golden to reddish in colour; leaves subpetioled, hairy in axils, stipulate; leaflets 3 or abnormally 4 or 5 where leaflets replace the stipules; stipules short, subulate, minute or wanting; leaflets subterete, sulcate or open backed below, coriaceous, curved, ascending 0·8–1·8 cm. long; bracts obtuse, deeply plicate, apex recurved, coriaceous, glabrous outside, hairy inside, 4–5 mm. long; pedicel 5–7 mm. long, pubescent; calyx pubescent in and outside and on margin, becoming glabrous; petals 1·2 cm. long, legume 3 cm. long, oblique and curved, several seeded.

Rami juniores pubescenti, seniores glabri aurei vel rubro-brunnei. Folia petiolata, stipulata, 3-5 foliolata, axillis villosis. Foliola subteretia, 0.8-1.8 cm. longa, glabra, sulcata, marginibus revolutis. Stipulae subulatae, minutae vel nullae. Bracteae 4-5 mm. longae, plicatae, apice recurvae, intus pubescentes, extus glabrae. Pedunculi 5-7 mm. longi, pubescentes. Calycis lobi 1-2 mm. longi, pubescentes, basi lati apice obtusi. Legumen obliquum, leviter curvatum.

Uniondale Division: Hoopsberg, Esterhuysen 6549 (Type in Herb. Bolus); Mannetjiesberg, Esterhuysen 6466; Smutsberg, Esterhuysen 7035; Marloth Herbarium, under C. longiflora, no locality or details.

15. C. falcata (Harv.) comb. nov.

C. vogelii var. falcata Harv. 1.c.; C. brachypoda Hofm. and Phill. 1.c. pro parte, non Benth.

Glabrous erect shrub, stems angled to terete, with a golden sheen or glaucous; leaflets flat or margins revolute, oblong elliptical, linear, ovate or lanceolate tips mucronate, base acute or obtuse, midrib prominent below, up to 2·8 cm. long, up to 1 cm. broad, glaucous, coriaceous; bracts large, 5-9 mm. long, keeled, acuminate, ovate, puberulous inside, glabrous outside, as long as, or exceeding petiole; calyx lobes acute to obtuse, lanceolate, falcate, pubescent on margins, 4-8 mm. long.

Var. ovata var. nov.; leaflets short, ovate, margins crinkled slightly, bracts and calyx shorter, leaves stipulate, leaflets 0.5-1 cm. long, 0.19-0.5 cm. wide, bracts 3-6 cm. long, acuminate.

Var. ovata var. nov.: foliolis ovatis 0.5-1 cm. longis 0.1-0.5 cm. latis, bracteis 0.3-0.6 cm. longis acutis lobis calycis lanceolato-falcatis.

Tulbagh Division: Zeyher 354. Worcester Division: Onklaarberg, Stokoe 1158; Paarl Division: Fransch Hoek, Bolus 5151. Caledon Division: Alexander, Oct. 1846. Elgin, F.D.H. 2841, Swarteberg, Schlechter 5583. Stellenbosch Division: Helderberg, Parker 3392. Robertson Division: Onklaarberg, Stokoe 7411. Var. ovata; Ceres Division: Michells Pass, Esterhuysen 6167. Tulbagh Division: Witzenberg, Esterhuysen 1281. Worcester Division: Hexrivier, Esterhuysen 9362; Matroosberg, Gillett 3603; Chavonnesberg, Esterhuysen 8175. Caledon Division: Rivier-Sonder-End, Stokoe 7391. Paarl Division: Wemmershoek, Esterhuysen 11272.

16. C. buxifolia (Burm. f.) comb. nov.

Genista buxifolia Burm. f. l.c.; Cyclopia latifolia D.C. l.c.; Harv. l.c.; Hofm. and Phill. l.c.; C. cordifolia Benth. Ann. Mus. Vind. 2: 67 (1838). C. latifolia Benth. in Hook. Lond. Journ. Bot. 2: 432 (1843).

Glabrous shrub; stem ribbed, downwards from leafbases, glaucous, purplish when dried; leaflets ovate or ovate-lanceolate, truncate or cordate at base, 0.5-2.5 cm. long and 0.3-1.4 cm. broad, coriaceous with impressed veins on undersurface of leaflet, petiolate, apex obtuse; bracts lanceolate, keeled, acuminate, 4-7 mm. long, shorter or equal to pedicel; calyx tube short, lobes acute, ovate, equal to or exceeding tube, rare.

No locality: Scholl in Herb. Mus. Vind. (1836). Cape Division: Table Mountain, Bodkin in Bolus Herb. 8038; Esterhuysen 4014; Constantiaberg, Wolley-Dodd, 3450; Waai Vlei, Wolley-Dodd 3399. Ladismith Division: Swartberg, Marloth 3988 b. Prince Albert Division; Swartberg, Pocock 164.

17. C. intermedia E. Mey. l.c. exl. lit. C. "Kouga Bush tea" Walp. l.c.; Benth. in Hook. Lond. Journ. Bot. 2 (1843); C. vogelii var. intermedia Harv. l.c.; C. brachypoda var. intermedia Hofm. & Phill. l.c.; C. aurea Fourc. in Trans. Roy. Soc. S.A. 21 (1934); C. subternata Hofm. and Phill. l.c. partly.

Erect shrub 0.5-0.7 m. high; stem and leaves with a golden sheen when dried; twigs angular; leaflets on a decurrent shield, ciliate within, linear cuneate with revolute margins, 16-30 mm. long, 2.5-6 mm. broad, coriaceous, obtuse, mucronate; bracts 2, concave, ovate, obtuse, keeled, coriaceous, thickened with age, hirsute within, pubescent on margins, 3-6 mm. long, shorter than pedicel; pedicels vary from 0.3-2 cm. in length; calyx lobes short, deltoid-ovate, obtuse, roundbacked, lowest lobe keeled, longer pubescent on margins, sparsely hairy within, 2-3 mm. long at first glaucous, becoming shiny, coriaceous.

No locality: Drege (1836) Hort. Reg. Berl.

Riversdale Division: Marloth 5666; Garcia's Pass, Galpin 3900; Langeberge, Marloth 7186 (?). Oudtshoorn Division: Olifants River, Gill, Herb. Kew; Uniondale Division: Langkloof, Burchell 4929; Kouga Mountains, Esterhuysen 10738; 7036. Humansdorp Division: Zuur Anys, Fourcade 3049; Blouberg Forest, Holland 4063, Dix 3.

18. C. dregeana nom. nov.

C. latifolia E. Mey. l.c. non. D.C.; Walp, l.c. partly; non Benth.; C. vogelii var. subternata Harv. l.c. partly; C. subternata Hofm. and Phill. l.c. partly.

Erect shrub, stem ribbed to terete, purplish; leaflets lanceolate, acute at base and apex, slightly veined on undersurface, coriaceous, margins revolute, 2·5 cm. long, 0·8 cm. broad, shortly petiolate, and leaves minutely stipulate on some twigs, bracts small, acute, keeled, about one-third length of pedicel, 3 mm. long; calyx lobes lanceolate, acute, overlapping at the base. Differs from C. intermedia by small acute bracts and veined leaflets, from C. buxifolia by narrow lanceolate leaflets, from C. subternate by acute leaflets, and slightly larger bracts and calyx lobes, and from C. falcata by smaller size of bracts and calyx.

Ceres Division: Schurfteberg, Compton 16230. Tulbagh Division: Grant 2474. Worcester Division: Du Toits Kloof, Drege (1836). Paarl Division: Fransch Hoek, Bolus (1895).

19. C. sessiliflora E. and Z. non E. Mey, l.c. "Heidelbergtee," "Gewone bossiestee," "Hottentotstee".

Vogel l.c.; Walp. l.c.; C. brachypoda Benth. in Ann. Mus. Vind. 2, 1: 67 (1837); Hook, Lond. Journ. Bot. 2. (1843); C. vogelii var. brachypoda Harv. l.c. 6; C. brachypoda Hofm. and Phill. l.c. partly; Rafnia retroflexa B. Thb. in Herb. Thb.

Shrub with virgate, subfastigiate flexuous branches, stem cicatrised at base; leaflets linear or oblong, obtuse or attenuate at base, margin flattened or revolute, shiny on upper surface, veined below; membranous or subcoriaceous, dense to laxly leafy, leaves ascending; bracts 1-2.5 mm. long, ovate, clasping pedicel, pedicel scarcely exceeding bracts, may elongate in fruit; calyx lobes 2-4 mm. long, short, subacute or obtuse; vexillum emarginate; fruit obliquely lanceolate.

No locality: *Burchell* 6117, 7223; Herb. Hook., *Mundt*. Herb. Hook. Swellendam Division; Puspasvlei, *E.* and *Z.* 1147; Lemoenshoek, *Esterhuysen* 10443. Riversdale Division: Langberg, *F.D.H.* 2844, 2845, *Marloth* 9318; *Muir* 483, *Burchell* 6701.

20. C. subternata Vogel 1.c. 595; "Gewone bossiestee".

Benth., Hook. Lond. Journ. Bot. II (1843) partly; Hofm. and Phill. l.c. partly; C. grandiflora A.D.C. Not. 8 ml. Pl. Rar. Jard. Genev. 29 (1840); C. grandifolia Benth. l.c.; C. laxiflora Bth. Ann. Mus. Vind. 2 (1837); C. latifolia E. and Z. non D.C. l.c.; C. vogelii var. subternata Harv. l.c. partly; C. vogelii var. laxiflora Harv. l.c.; C. latifolia Walp l.c. partly; Benth. Ann. Mus. Vind. II (1840) 67.

Shrub 1–3 m. high; twigs angled, becoming terete, at first glaucous; leaflets sometimes minute on young twigs, 2–3 mm. long, when expanded 2·5 cm. long, 0·5 cm. broad; spathulate lanceolate or sublinear, obtuse at apex, tapering to base, flat or margins slightly revolute, membranous to subcoriaceous; bracts 2–5 mm. long, keeled, about a third the length of pedicel or less, acute or acuminate, sulcate on either side of keel; calyx lobes short acute, deltoid, 2–3 mm. long.

Differs from *C. falcata* by the small bracts and short calyx lobes, and from *C. sessiliflora* by the pedicels being much longer, and by the presence of axillary shoots with small leaves.

Var. laxiflora (Bth.) comb. nov. has leaflets narrowly linear, spathulate, membranous, otherwise as type.

No locality: Burchell 5519, 5549, 6016; Bowie: Herb. Berol.; Herb. Benth.; Mundt, Herb. Hook. Riversdale Division: Garcias Pass, Phillips 341; Langeberg, Muir 798. George Division: Alexander Aug. 1847; Outenique Mountains, Hops 54; Knysna, Kapp 48; Rodin 1169; Salter 6938; Keet, Sept. 1918. Uniondale Division: Zitzikama, Galpin 3899; Joubertina, Esterhuysen 10599. Humansdorp Division: Clarkson, Thode A785; Coldstream, Marloth 13063; MacOwan A.K.; Fourcade 1631. Var. laxiflora: Knysna: Plettenberg, E. and Z. 1149.

OTHER SOURCES OF "BUSH TEA".

Aspalathus tenuifolia D.C. Prod. 2, p. 143 (1825).

A slender shrub, with leaves needle-shaped, up to 6 cm. long, single or fascicled, curved or straight; flowers few, interruptedly racemose, flowers distant, pedicels 4–5 mm. long. Calyx teeth short, distant on the tube; vexillum pubescent, longer than the arched, glabrous or puberulous carina. Leaves, twigs and calyx laxly adpressed hairy. The flowers are up to 1 cm. long, larger than in *A. contaminatus*. This shrub only occurs in the Piquetberg District and is the source of "Naald Tee" according to Marloth.

Piquetberg District: Drege, rocky gorge on mountain, Nov. 1830; Pillans 7316; Bolus 7526; Edwards 221; Marloth 5361, 11063.

Aspalathus contaminatus (Thb.) Druce Rep. Bot. Ech. Cl. Br. Is. 1916; A. lebeckia contaminata Thb. Fl. Cap. (1823) 561; A. corymbosus E. Mey. Linnaea (1832) 159; Borbonia pinifolia Marl. Trans. Roy. Soc. S.A. II (1912) 238.

Shrub prostrate or erect and up to 2 m. high, with numerous intermediate forms, leaves solitary or fascicled, long linear terete, $2 \cdot 5 - 4$ cm. long, stouter than in A. tenuifolia and usually straight; flowers on short pedicels, few, in pairs or imperfect corymbose-racemules; calyx teeth lanceolate, shorter than tube, 2 mm. long, corolla $0 \cdot 5$ cm. long, vexillum pubescent, carina pubescent, equal*in length to the vexillum. Marloth states that this plant is used as the source of "naald tee", "koopmans tee", "Black tea" or

"rooibostee" on the Cedar Mountains near Clanwilliam. The form on the Cape Peninsula is prostrate, while the form on the Cedar Mountains attains the height of 2 metres, but they cannot be separated on any other character.

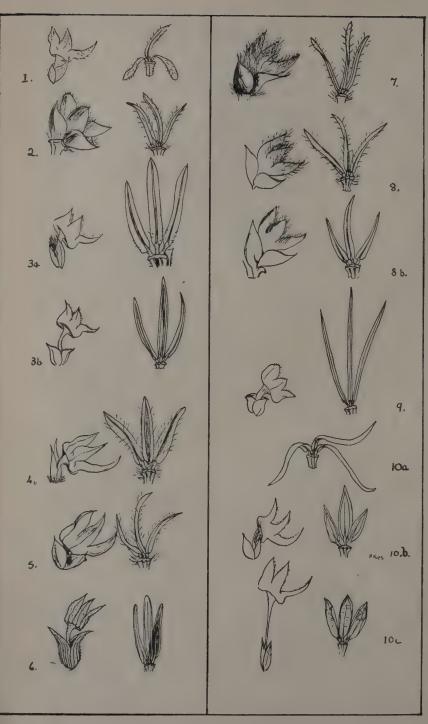
No locality: Ecklon 56, Ecklon and Zeyher 1396; Herb. Harvey 804 (1839); Mund Maire; Lehman; Wallich, Pappe 431. Calvinia Division: Henrici 3413. Clanwilliam Division: Cedar Mountains, Marloth 4728; 7428; Olifants River Mountains, Marloth 7369; Pakhuis Pass, Esterhuysen 7420, Salter 5045; Bath in Bol. Herb. 15421; Rogers 16817; Drege; Wipperthal, Marloth 8313. Ceres Division: Klein Vlei, Schlechter 10065. Worcester Division: Stokoe 7308, van Breda 5. Malmesbury Division: Groenkloof, Zeyher 440. Paarl Division: Paarl and Pont. Drege (1830). Stellenbosch Division: Simonsberg, Wolley-Dodd 286. Somerset West Division: Sir Lowry's Pass, Schlechter 7201. Cape Division: Table Mountain, Prior. MacOwan 59; Vlaggeberg, Wolley-Dodd 720; Simonstown, Schlechter 308, Bolus 3815; Cape Town, Rogers 16139, Burchell 917. Caledon Division: Burchell 8128.

SUMMARY OF COMMON NAMES OF SPECIES USED AS TEAS AND THEIR LOCALITIES.

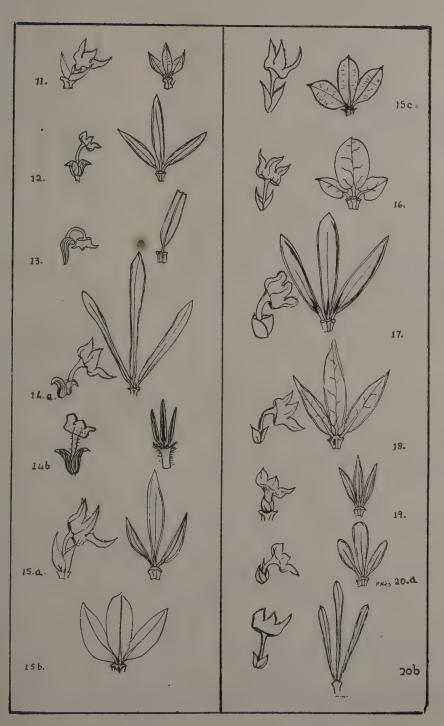
Vlei tee	C. bowieana Harv. (=C. ashtonii Hofm. and Phill.) Only on Langeberge to Outeniquas. Swellendam to George.
Vlei teé	 C. maculata (Andr.) Comb. nov. (=C. tenuifolia Lehm.) Drakenstein Mountains, Rivier-Sonder-End Mountains and Langeberge. (Worcester, Paarl, Stellenbosch, Somerset West, Caledon, Swellendam, Riversdale Districts.)
Heuning tee	C. genistoides R. Br. (most common tea plant). Table Mountain and Coast, Drakenstein Mountains, Rivier-Sonder-End Mountains, and Potberg (with outlying specimen in Uniondale District). (Malmesbury, Cape, Paarl, Worcester, Somerset West, Caledon, Bredasdorp, Swellendam and Uniondale Districts.)
Heuning tee	C. burtonii Hofm, and Phill. Swartberg only. (Oudtshoorn and Prince Albert Districts.)
Bossies tee Swartberg tee	C. subteretifolia sp. nov. Koue Bokkeveld Mts., Witteberg, Klein Swartberg, Groot Swartberg, Langeberge. (Ceres, Laingsburg, Prince Albert, Ladismith, Oudtshoorn, Riversdale Districts.)
Gewone bossies tee Heidelberg tee Hottentots tee	C. sessiliflora E. and Z. (=C. brachypoda Hofm. and Phill.) Langeberge only. (Swellendam and Riversdale Districts.)
Gewone bossies tee	C. subternata Vogel (=C. subternata Hofm. and Phill.) Langeberge, Attaquas, Outeniquas, Zuuranys, Langkloof, Zitzikama, Kouga Mts. (Coastal ranges from Riversdale to Humansdorp Districts.)

Kouga bush tea	C. intermedia E. Mey. (=C. aurea Fourc.) Langeberge, Kamnassie, Kouga, Langkloof Zuuranys Mts.
	(Riversdal, Oudtshoorn, Uniondale, Humansdorp Districts.)
Naald tee	Aspalathus tenuifolia D.C. Piquetberg only.
Naald tee	Aspalathus contaminatus (Thb.) Druce (=Borbonia pinifolia Marloth.) Cedar Mts., Olifants Rivier Mts., Drakenstein Mts., Table Mountain. (Calvinia, Clanwilliam, Ceres, Worcester, Paarl, Stellenbosch, Somerset West, Caledon, Malmesbury and Cape Town Districts.)
	CYCLOPIA INDEX
C. ashtonii Hofm. & Phill C. aurea Fourc C. aurescens sp. nov C. aurescens var. glauca var. C. bolusii Hofm. & Phill C. bowieana Harv C. brachypoda Hofm. & Phill C. brachypoda Benth C. buxifolia (Burm. f.) comb. C. capensis Salter C. cordifolia Benth C. dregeana nom. nov C. elata Sweet C. falcata (Harv.) comb. nov. C. faliformis sp. nov C. galioides (Berg.) D.C C. galioides E. Mey C. galioides E. & Z C. genistoides var. linearifolia C. genistoides var. linearifolia C. genistoides var. heterophyl	Bowieana Harv. 164
C. genistoides var. ovalifolia v C. genistoides var. teretifolia E. C. genistoides E. Mey C. grandifolia Benth C. grandiflora A.D.C C. heterophylla E. & Z C. intermedia E. Mey	ar. nov. 166 & Z. comb.nov. 166
C. laricina E. Mey. C. latifolia Benth. C. latifolia D.C. C. latifolia E. & Z. C. latifolia E. Mey. C. laxiflora Benth. C. longifolia Vog.	= maculata comb. nov. 166 = buxifolia (Burm. f.) comb. nov. 168 = buxifolia (Burm. f.) comb. nov. 168 = subternata Vogel. 170 = dregeana nom. nov. 169 = subternata Vogel. 170
C. maculata (Andr.) comb. no C. meyeriana Walp C. montana Hofm. & Phill C. montana var. glabra Hofm C. plicata sp. nov C. pubescens E. & Z C sessiliflora E. & Z	v. =tenuifolia Lehm. 166 =sessiliflora E. Mey 165 & Phill. 165 & Phill. 168
C. sessiliflora E. Mev	

C. subternata Vog		170
C. tenuifolia Lehm	=maculata Andr. comb. nov	166
C. teretifolia E. & Z	= genistoides R. Br. var. teretifolia E. & Z. comb.	
	nov	166
C. ternata Sweet	=Aspalathus ferruginea	
C. triphylla Sweet	= Argyrolobium sericeum	170
C. vogelii Harv	= subternata Vogel (partly)	170
C. vogelii var. subternata Harv	= subternata Vogel = sessiliflora E. & Z	169
C. vogelii var. brachypoda Harv	= intermedia E. Mev	169
C. vogelii var. intermedia Harv	= subternata Vogel	170
C. vogelii var. falcata Harv	= falcata Harv, comb, nov	168
Galega genistoides Thb	=C, genistoides R. Br	166
Galega var. B	=C. galioides D.C	164
Genista buxifolia Burm	=C. buxifolia (Burm. f.) comb. nov	168
Gompholobium maculatum Andr	=C. maculata (Andr.) comb. nov	166
Ibbetsonia genistoides Sims	= C. genistoides (L.) R. Br	166
Podalyria genistoides Willd	=C. galioides (partly)	164 166
	=C. genistoides (partly)	164
Sophora galioides Berg	= C. galioides D.C = C. genistoides (L.) R. Br	166
Sophora genistoides Berg	= C. genistoides (L.) K. Bi	166
Sophora genistoides BurmSophora genistoides Linn	=C. genistoides	166
Sophora genistoides Thb	= C. genistoides	166
Suphora genistuides into	O. Bonner	



- 1. C. bolusii Hofm. & Phill.
 Bolus 11465, Swartberg Pass.
 2. C. bowiena Harv.
 Bowie, Herb. Kew.
 3. (a) C. aurescens Kies
 Primos, 33, Seweweekspoort.
 (b) C. aurescens var. glauca Kies
 Pappe (Harv. t. XXIV), Cape of
 Good Hope.
 4. C. galioides DC.
 Bolus 67, Vishoek.
 5. C. capensis Salter
 Galpin 12694, Cape Peninsula.
 6. C. pubescens E. & Z.
 E. & Z. 1146, Uitenhage.
 7. C. meyeriana Bth.
 Drege (1836).
 8. (a) C. montana Hofm. & Phill.
 Phillips 11131, Tubbagh.
 (b) var. glabra
 Marloth 2277, Matroosberg.
 9. C. maculata (Andr.) Kies
 E. & Z. 1150, Swellendam.
 10. (a) C. genistoides R. Br.
 Drege (1836).
 (b) var. heterophylla E. & Z.
 E. & Z. 1148, Swellendam.
 (c) var. ovalifolia var. nov.
 Esterhuysen 2635, Caledon,
 Somerset, Sneeukop.



11. C. burtonii
Burton, F. D. H. 2914 (Type).
12. C. filiformis sp. nov.
MacOwan 336/A.K. Nov.,
Van Staadensrivier.
13. C. longifolia Vogel
Mundt & Maire, Hort.
Reg. Berol.
14. (a) C. plicata sp. nov.
Scrap in Herb. Marloth.
(b) C. plicata sp. nov.
Esterhuysen 6549,
Uniondale, Hoopserg.
15. (a) C. falcata (Harv.) comb. nov.
Zeyer 354.
(b) Alexander Oct. 1846, Caledon.
(c) C. falcata var. ovata var. nov.
Esterhuysen 6167, Ceres, Slab
Peak.

Esterhuysen 6167, Ceres, Slab Peak.

16. C. buxifolia (Burm.) Kies Bolus 8038, Table Mt.

17. C. intermedia E. Mey. Fourcade 3049, Humansdorp.

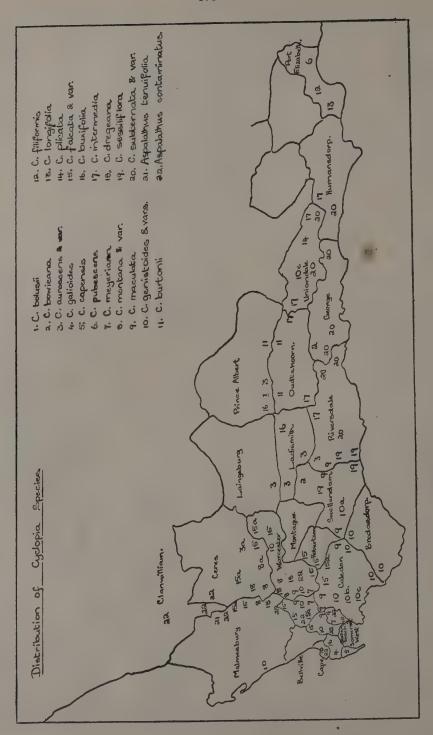
18. C. dregeana nom. nov. Drege (1836) (Type), Du Toit's Kloof.

19. C. sessiliflora E. & Z.

10. (a) C. subternata Vogel Burchell 5519.

(b) C. subternata var. laxiflora

(b) C. subternata var. laxiflora (Bth.) comb. nov. E. & Z. 1149, Plettenberg Bay.



Notes on Asparagus Africanus and Related Species.

By

P. Kies.

On examining the material at Kew Herbarium, which Baker had placed under Asparagus africanus and its varieties, it appeared that several unrelated plants had been placed together. Several of the specimens belong to other species, and some of his varieties are worthy of specific rank. The following changes in nomenclature are proposed.

1. A. africanus Lam. Encyc. I, 295 (1783); Asparagus dependens Thb. Prod. Pl. Cap. (1794); Asparagopsis juniperina Kunth, Enum. V, 74 (1850); Asparagopsis niveniana Kunth l.c., Asparagopsis lamarckii Kunth l.c.

Lamarck's description of this species states that the stem is woody, angled, leaves setaceous, curved, 10-20 per fascicle, and that at the origin of each branch and under each fascicle one finds an acute reddish spine, bent slightly backwards. The specimens agreeing with this description are those which according to notes C. E. Moss had previously to this, compared with the types of A. dependens and A. juniperina.

Stem twining, angled and furrowed (in dried state) green, minutely pubescent. Branches short, twining, angled. Spines 6 mm. long on main stem, reduced to 1 mm. on branches, reddish in colour, patent or reflexed at an acute angle, curved or straight, Cladodes fascicled, 5–20 per cluster of various lengths, usually 1 cm. long, spreading straight or curved, slender, subterete. Flowers 3 or more per fascicle, peduncle jointed in the lower third.

CAPE PROVINCE.—Cape Division: Table Mountain, Dec. 1846, *Prior*; Rondebosch, *Prior*, *Burchell* 389. Paarl Division: French Hoek, *Schlechter* 9218. Swellendam Division: *Burchell* 7221. Uitenhage Division: *Drege* 8576, *Zeyher* 178. Alexandria Division: Addo, *Burchell* 4269. Karoo: *Gill.* Reg. Orient: *Prior*.

la. A. africanus Lam. var. brevifolia Kies var. nov. Typo similis sed cladodiis adscendentibus differt. Cladodia brevia, 5-6 cm. longa, adscendentia. Caules erecti; rami adscendentes. Squamae ramorum et ramulorum basi in calcaria pungentia deflexa rigida productae.

Differs from the type in that the cladodes are ascending, and short, not curved, spreading and long. *Cladodes* short, 5-6 cm. long, ascending. *Stem* erect, branches, ascending; squamae below branches and branchlets produced into a rigid, sharp, slightly deflexed spine.

CAPE PROVINCE.—Kaffraria: Cooper 191.

NATAL.—Umvoti Division: Greytown, Wylie; Bothas Hill, Hutchinson 4703. Alexandra Division: Flanagan 253. Inanda Division: Wood 989. Zululand: Eshowe, Gerstner 2405.

2. A. multiflorus Bak. in Journ. Linn. Soc. XIV, 610 (1874); A. dependens Bak. (non Thnb.) Fl. Cap VI, 266 (1896); A. africanus var. pubescens Bak. in Journ. Linn. Soc. XIV, 610 (1874); A. africanus var. dependens Bak. Fl. Cap VI; 266 (1896).

The specimens which Baker cites under A. africanus var. B, are conspecific with A. multiflorus Bak. This species differs from A. africanus in the stems being pubescent, not glabrous, and in the deflexed branches and deflexed cladodes.

Branches scrambling, lax, pubescent, green. Spur reduced, not spiny under the fascicles of cladodes. Branchlets deflexed, cladodes ascending or deflexed, 6-12 per fascicle, stout, terete, usually straight. Flowers 8 or many per cluster, peduncles jointed in lower third.

CAPE PROVINCE.—Somerset Division: Bowker (Type in Kew Herb.). Beaufort Division: Cooper 523. Albany Division: Cooper 3250. Kaffraria: Cooper 404. Uitenhage Division: Zeyher 4158, 236; Enon, Thode A 2769.

3. A. concinnus (Bak.) Kies stat. nov.; A. africanus var. concinnus Bak. in Journ. Linn. Soc. XIV, 619 (1874); A. laricino affinis sed humilior.

Radices incrassatae, fusiformes, 1 cm. diametro. Rhizoma squamis stramineis 1 cm. longis vestita. Caulis fruticosus, erectus vel subscandens, 60–90 cm. longus; rami sulcato-costulati; costulis minute albo-scabridis demum laevigatis nitido-griseis vel rubris; ramuli breves, fasciculati vel solitarii, erecto-patentes. Squamae ad basin fasciculorum membranaceae, acuminatae, basi in calcaria, pungentia, recurva, brunnea productae. Cladodia 0·4–1 cm. longa, 15–70 fasciculata, viridia, teretia, apice mucronulata, leviter curvata vel structa. Flores 1–7 fasciculati. Pedunculi 5–6 mm. longi, basin versus articulati. Perianthium 0·3 mm. longum, segmentis recurvatis cremeis dorso laete viridi-carinatis. Filamenta patentia, basin versus perianthio adnata; antherae aurantiacae demum rubrae. Ovarium globosum, viride; stylus brevis, trifidus. Bacca globosa, rubra. Semina globosa, nigra.

Roots thick, fusiform, 1 cm. diam.; bud-scales on rhizome 1 cm. long, horny, yellowish. Shrublet 60-90 cm. high, unbranched for 10 cm., with adpressed squamae. Branches scrambling, white, striate, with minute retrorse hairs on striae, the older stems becoming smooth, shiny, blue-grey or reddish, branchlets short, single or fascicled, erect-spreading. Squamae thin, membranous with acuminate apex, basal spur sharp, recurved, brownish, spiny under each fascicle of cladodes. Cladodes 4-1 cm. long, 15-70 per clustre, arising in axils of spines, pale green, terete (triquetrous in dried specimens), mucronate, straight or slightly curved. Flowers 1-7, usually 3 per fascicle. Peduncle jointed near the base, 5-6 mm. long. Perianth 3 mm. long, lobes reflexed, creamy, with pale green midline to each segment. Stamens spreading, filaments adnate to perianth at base; anthers orange, becoming dark red. Ovary green, globose, style short, stigmas 3, papillate at tips. Berries globose, red, seed globose, black.

This is related to A. laricinus, both having white striate stems. It differs from A. laricinus, in the low habit, short internodes and short cladodes. It differs from A. microphyllus in having straight cladodes and spines under each fascicle of cladodes. Baker cites these specimens under A. africanus, but the white striate stems would indicate a close relation with A. laricinus rather than with A. africanus.

CAPE PROVINCE.—Somerset East Division: Bruintjies Hoogte, Burchell 3020 (Type in Kew Herb.). Colesberg Division: Shaw, Kuruman Division: Burchell 2443.

O.F.S.—Fauresmith Division: Veld Reserve, Verdoorn 1186, 955; Mogg 17085; Voelfontein, Kies 339. Wepener Division: Acocks 11172.

TRANSVAAL.—Lydenburg Division: Wilms 1551.

FIG. 1.

4. A. microphyllus Burch. ex. Bak. Fl. Cap. VI, 266 (1896); A. africanus var. γ Bak. l.c. A. microphyllus Burch. mss.

Stem stout, scrambling, shrubby, curved between two nodes, white striate, minutely hirsute on striae. *Spines* on main stem 2-7 mm. long, hirsute, deflexed, none under fascicles of cladodes. *Branches* lax, similar to main stem. *Cladodia* 4-20 per fascicle, 8 mm. long, curved terete, glabrous. *Flowers* 1-3 per fascicle, peduncle jointed in lower third, cladodes up to 12 mm. long.

Differs from A. africanus in the white ribbed stem, lack of spines under the cladodes, and the much curved cladodes. Differs from A. retrofractus by stouter habit and shorter cladodes.

S.W.A.—Great Namaqualand: Karasberg, Naruda, *Pearson* 7964. Kubib, *Pearson* 9478; *Hoffnungsfelde* 9536.

BECHUANALAND.—Kosi Fontein, Burchell 2572 (Type in Kew Herb).

5. A. compactus Salter in Journ. S.A. Bot. VI, 165 (1940); A. africanus var. wrightii Bak. Journ. Linn. Soc. 14; 610 (1874). Differs from A. africanus in the ribbed white stems and trigonous cladodes.

CAPE PROVINCE.—Cape Division: Prior, Cape Town. Caledon Division: Zwarteberg, Schlechter 10364.

6. A. pearsonii Kies sp. nov.; A. multifloro Bak. affinis sed ramis glabris laxioribus differt.

Suffrutex erectus vel subscandens, 1 m. altus. Caules laxe ramosi, subscandentes, teretes, longitudinaliter striati, scaberuli, virides, recti. Rami subhorizontales vel deflexi, sparsi. Squamae ramorum basi in calcaria pungentia productae, ramulorum minores. Cladodia fasciculata, pauca, 0.3-2.5 cm. longa in quoque fasciculo 2.6, teretia, recta vel curvata, deflexa vel adscendentia. Flores pauci, 2-4-nati, pedunculi breves, 2-3 mm. longi, medio articulati. Perianthium albidum segmentis patentibus brunneo-carinatis. Filamenta perigonio $\frac{1}{3}$ breviora. Ovarium 1.5 mm. longum, ovoideum. Stylus 0.5 mm. longus, trifidus.

Bush or scrambler 60-100 cm. high. Stems laxly branched, stout, longitudinally striate, slightly zigzag or straight. Branches few, horizontal or deflexed. Spines on main stem soft, on branchlets reduced to minute blunt spurs. Cladodes few, 2-6 per cluster, varying from 0.3-2.5 cm. long in same cluster, terete, straight or slightly curved, deflexed or ascending. Peduncle short, 2-3 mm. long, jointed near the middle. Flowers few, 2- or 4-nate, white, 5 mm. diam.; perianth lobes spreading, keeled with a brownish stripe. Stamens $\frac{1}{3}$ shorter than the perianth. Style 5 cm. long, with 3 short branches. Ovary 1.5 mm. long, ovoid.

This species is near A. multiflorus, but the stem is not pubescent and it differs from A. africanus by the reduced spurs on the branchlets, and it also differs in the cladodes being of various lengths in each fascicle.

S.W.A.—Great Namaqualand: Great Karasberg, *Pearson* 7965; Klein Karasberg, *Pearson* 9722; *Ortendahl* 83; between Sabiesis and Holoog, *Pearson* 4601; Ramans Drift, *Pearson* 4548, 4003 (Type in Kew Herb.); Bysonderheid, *Schinz* 30.

7. A. rivalis (Burch.) Kies sp. nov.; A. rivalis Burch. nomen nodum; A. asiaticus Bak. pro parte, Fl. Cap. 6: 265 (1896); A. africanus Bak. pro parte, l.c.

The description of A. asiaticus given by Linnaeus is of an erect spiny stem, with filiform branches and setaceous fasciculate leaves. There is no specimen of this species in the Linnaean Herbarium, and the description was derived from the figure in Pluk. Am. 54 t. 15 f. 4 (Mant. 366), which shows a stiff shrubby habit, with small spines under each fascicle of cladodes. This does not agree with the South African species described by Baker under this name, which is a laxly branched climber, with spines only on the main stem, and none under the cladodes. The A. asiaticus of Hooker is closely related to the South African A. asiaticus of Baker, but differs in having the pedicels bent at right angles at the joint, while in Baker's species this is never seen. I suggest naming the species A. rivalis, taking the name which Burchell used (without description) for his specimen from Kosifontein No. 2587. Baker cites this name as a synonym under A. asiaticus, and quotes Burchell's specimen. Baker also places under A. africanus specimens which belong here.

Caules fruticosi, erecti vel scandentes, 60–180 cm. alti. Rami subscandentes, sparsi, horizontales, virides, glabri vel puberuli, striati, angulati vel teretes. Squamae ramorum albae, amplexicaules, fimbriatae, basi in calcaria pungentia non indurata flavescentia productae; ramulorum minores basi in tubercula minuta productae. Cladodia 2–20, recta, 2–20 mm. longa, internodiis longiora. Pedunculi 1–3 vel plures fasciculati, 6–10 mm. longi, prope basin articulati. Perianthium 6 mm. diam., lobis stellato patentibus. Stamina perigonio \(\frac{1}{3} \) breviora. Bacca globosa, perianthio basi subpersistente.

Climber or erect shrub, 60–180 cm. high with branches 1–5 cm. apart, lax, at right angles to stem, twining or curving. *Stem* green, glabrous or minutely puberluous, striate, angled or terete, slender. *Squamae* on main branches white-membranous with basal spurs soft, straight, yellowish; on the branchlets the squamae clasp the base of the cladodes, and the spurs are reduced to minute tubercles. *Cladodes* straight, varying in length from 2–10–20 mm. usually exceeding the internodes, 2–20 cladodes per fasicicle, usually 10. *Pedicels* 6–10 mm. long, articulating in lower-third, 1–3 or more per fascicle, straight. *Perianth* 6 mm. diam. lobes stellately spreading. *Stamens* 2/3 length of perianth. Berry sphaerical, with subpersistent perianth at base.

CAPE PROVINCE.—Albany Division: Grahamstown, Galpin 284. Graaff Reinet Division: Bolus 132. Colesberg Division: Shaw; Aliwal North, Drege 4481b; Gerstner 160. Kimberley Division: Warrenton, Adams 802. Herbert Division: Douglas Orpen 237.

BECHUANALAND.—Mochudi, Rogers 6252; Gaberones, Oct. 1913 Rogers; Lobatsi, Rogers 6041; Kosifontein, Burchell 2587 (Type in Kew Herb.); Maadji Mountain, Burchell 2376; Mafeking, Burtt Davy 11019, 11087.

S.W.A.—Hereroland: Kalkfeld, Engler 6443.

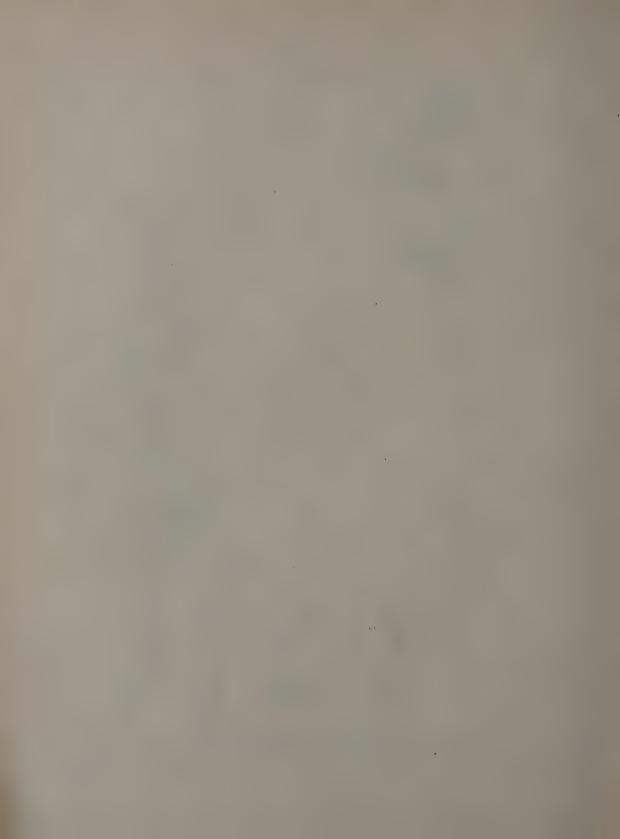
O.F.S.—Bethlehem Division: *Phillips* 3152. Bloemfontein Division: *Gemmell* 4955. Senekal Division: *Goossens* 880.

Transvaal.—Shilouvane, Junod 617. Waterberg Division: Burtt Davy 7051. Lydenburg Division: Thode A 1648. Pretoria Division: Repton 632, Mogg 14839. Brits Division: Mogg 14623. Barberton Division: Galpin 622.

NATAL.—Colenso Division: Wood 4089. No locality, Gerrard 70, 126.



Asparagus concinnus (Bak.) Kies (Kies 339). FIG. 1.—Twig, \times 1; 2.—Dry twig showing fascicled short shoots, \times 1; 3.—Flower, \times 2; 4.—Perianth lobe and stamen, \times 3; 5.—Gynoccium, \times 3; 6.—Rhizome and tuberous roots, \times 1.



New and Interesting Records of South African Fungi.

By

P. H. B. Talbot.

Sometimes the author has the good fortune to collect, or to be sent, fungi which are apparently not recorded for South Africa. It seems desirable to place such species on published record and consequently this paper, the first of what is hoped will be a series, is presented.

It is a pleasure to thank all those who have assisted by sending collections. The author is also deeply indebted to the Director of the Commonwealth Mycological Institute and members of his staff, for their help and courtesy in checking some of the determinations. Without such collaboration it is often impossible to be sure of the identity of a fungus suspected of being a new record for the country.

No attempt has been made to list all the literature concerned with each species, nor to present a complete synonymy, since many of the most important papers are not available. Reference is made to papers which were useful in naming the collections, and in some of these there are lists of synonyms.

Unless otherwise stated, the numbers quoted below refer to collections in the Mycological Herbarium of the Department of Agriculture, Pretoria.

PATELLARIA ATRATA (Hedw.) Fries, Syst. Myc. 2 (1823) 160; Nannfeldt, Studien über die Morphologie und Systematik der nicht-Lichenisierten inoperculaten Discomyceten (1932) 328–330, f. 47; Phillips, Brit. Discomycetes, 2 Ed. (1893) 366; Rehm in Rabenh. Krypt.-Fl. 1, Abt. 3 (1896) 334 and 295, f. 1–6.

Lichen atratus Hedw., Spec. Musc. Frond. 2: p. 61, t. 21, f. A.

Lecanidion atratum (Hedw.) Rabenh.; Boudier, Icones Mycologicae 3 (1905–1910), Pl. 564; Butler in Mycologia 31 (1939) 612–623, Figs. 1 and 2; Ibid in Mycologia 32 (1940) Fig. 1 b., f. 2, f. 4a–d., descr. p. 799–803.

For synonyms see Rehm, l.c.

Illustrations: Nannfeldt, l.c.; Rehm, l.c.; Butler, l.c.; Boudier, l.c.; Text Fig. 1. Collections: No. 39186, P. H. B. Talbot on dead wood, Fountains, Pretoria, Nov. 1948.

Apothecia superficial on wood, adhering closely right up to the margin, waxy to subcoriaceous, black, sessile, plane or slightly convex, with raised margin, 0.5-1 mm. in diam. Asci cylindric-clavate, hyaline, with thickened apex, with a peculiar mode of dehiscence (see below), $11-13\times60.78~\mu$. Ascospores hyaline, fusoid to subclavate $(5-6.5)-8-9.6\times(30)-43-50~\mu$, with (3)-8-11 septa. Paraphyses exceeding the asci and forming an agglutinated layer at the apex, filamentous, septate, branching near the apex into short branches, the terminal cells of which are inflated and encrusted with blackish material.

There is apparently no published record of this species in South Africa, though there is a specimen of it, which the author has not seen, in the S.A. Museum [S.A. Mus. No. 33426, MacOwan (1058), on living bark of Acacia karroo, Boschberg]. The species is interesting on account of its peculiar mode of ascus dehiscence. This feature has been carefully studied by Butler, loc. cit., who summarises his investigations thus: "Lecanidion has been placed in the inoperculate Discomycetes, but has a method of spore discharge unique for that group. The outer ascus wall breaks at, or near, the

apex and rolls back; an inner membrane, here termed the endoascus, pushes up above the epithecium nearly one-third the length of the ascus; the spores are then shot out successively and forcefully from the apex of the projecting endoascus."

PERROTIA FLAMMEA (Alb. and Schw.) Boudier in Bull. Soc. Myc. de Fr. 17 (1901) 24, Icones Mycologicae Vol. 2, Pl. 321: Seaver, North Am. Cup-Fungi (1928) 154. Peziza flammea Alb. and Schwein., Consp. Fung. (1805) 319, Pl. 1, f. 6.

Lachnella flammea (Alb. and Schw.) Fries, Summa veg. Scand. (1849) 365; Phillips, Brit. Discomycetes 2 Ed. (1893) 407; Rehm in Rabenh. Krypt. Fl. 1, Abt. 3 (1896) 858.

For synonymy see Seaver, loc. cit.

Illustrations: Boudier, Icones Myc. Pl. 321; Text Fig. 2.

Collections: No. 39187, N. J. G. Smith, on dead twig of Acacia sp., Hennops River, Pretoria distr., Sept., 1948.

Apothecia at first round, commonly up to 0.5 mm. diameter, later elongated $1-1.3\times0.6-0.8$ mm., occurring superficially on wood, characterised by bearing a dense covering of brick-red hairs over the whole outer surface, especially well developed towards the apex of the apothecium, its base eventually becoming glabrous and black in colour. The margin is strongly inrolled. Asci are cylindric, tapering at the base, $90\times8~\mu$, operculate, octosporous. Ascospores biseriate, hyaline, fusoid-elliptical, eventually two-celled, straight or typically slightly curved, $3.2\times14.4-15.3~\mu$. Paraphyses simple, hyaline, septate, filamentous, exceeding the asci in length. External hairs simple, fuscous at the base, paling quickly above to hyaline, covered externally with minute brick red granules, septate, somewhat thick-walled, $3.2-4.8~\mu$ wide.

The maximum dimensions of the various organs cited by Seaver far exceed the measurements recorded here. These are nevertheless a very close match with those given by Rehm. There appears no doubt as to the identity of this collection. The species has not previously been recorded for South Africa.

ATICHIA GLOMERULOSA (Ach.) Stein in Cohn Crypt. Flora ii, Part 2, p. 356; Rabenhorst, Krypt.-Fl. Band 1, Abt. 3 (1896) 500; von Höhnel in Ann. Jard. Bot. Buitenzorg suppl. iii (1910) 19; Saccardo, Syll. Fung. 33 (1913) 769; Cotton in Kew Bull. Misc. Inf. (1914) 54–63; Fraser in Proc. Linn. Soc. New S. Wales 61 (1936) 279.

For synonymy see Cotton, loc. cit., p. 62.

Illustrations: Text Fig. 3.

Collections: No. 36995, G. A. Hepburn, associated with sooty moulds and scale insects on the upper surface of Valencia Orange leaves, Martindale, C.P., Dec. 1948.

Colonies globular, black, gelatinous when moist, 200-600 μ diam., obscurely lobed or sometimes expanded into a stellate body up to 2 mm. diam. and composed of (4)-5-6-(9) distinct rays attached lightly to the substratum by a brief stalk and gelatinous disk. There is no ordinary mycelium, the thallus being composed of branched chains of yeast-like cells held in a gelatinous matrix. The individual cells are hyaline, or dilutely coloured at the periphery, thick-walled, $8-9\cdot6$ μ diam., subglobose or elongated ovoid. The conidia are aggregated into balls known as "propagula" borne in a longitudinal, somewhat elliptical cleft on the upper surface of each ray in the stellate forms, or in groups near the surface in the globular forms. The propagula are roughly globose, 20-30 μ diam., composed of subglobose to elliptical cells, each $5\cdot8-7$ μ diam., with thick integuments, and dilutely coloured in a mass. Asci are found below the upper surface of the thallus, not in an apothecium; their exact location on the thallus could not be determined. The asci are pyriform, hyaline, with wall thickened as much

as $7.8~\mu$ at the apex, $23-28~\times~40-44~\mu$. Ascospores colourless, bicellular, deeply constricted at the septum, $5.8-7~\times~13.6-5.6~\mu$. No free ascospores were seen, so these may not be mature in size.

This collection appears to fit well the description of A. glomerulosa given by Fraser (1936, l.c., p. 279) and differs notably from other species whose descriptions have been traced. The species usually occurs on conifers, and in the globular form, but Fraser reports the stellate form and also records that the species is associated with Capnodium citricolum in some of McAlpine's collections. McAlpine's writings relevant to these collections have not been seen [Proc. Linn. Soc. N.S.W. 21 (1896) 469–497], but the present writer assumes that the host-plant was Citrus.

The systematic position of the Atichiaceae is discussed by Cotton (1914) and by Fisher [in Ann. Bot. n. ser. iii (1939) 399–426]. The other genus of the Atichiaceae, *Phycopsis*, is known in South Africa from the species *P. africana* Syd. [in Ann. Myc. 24 (1926) 265], but is distinguished from *Atichia* by an irregular distribution of the propagula (i.e., they are not restricted to definite areas on the thallus) and less importantly by the complete absence of a stellate thallus.

GLONIOPSIS LEVANTICA Rehm in Hedwigia 25 (1886) 142; Saccardo, Syll. Fung. 9 (1891) 1118; Bisby in Trans. Brit. Myc. Soc. 25 (1941) 130–135, Fig. 1 D; Ibid. 27 (1944) 26.

Illustrations: Text Fig. 4.

Collections: No. 36812, P. H. B. Talbot, on Acacia mollissima, Lions River, Natal, 17/5/48; No. 36994, P. H. B. Talbot, on Clerodendron glabrum, Meintjies Kop, Pretoria, July, 1948.

Hysterothecia erumpent or more or less superficial, solitary or crowded, usually straight, but occasionally curved at the centre when long, dull black, not striate, carbonous, fusoid, $0.5-0.7-1.4 \times 0.2-0.3$ mm., about 0.3 mm. high. Asci cylindrical or somewhat clavate, with short blunt base, fanning out in mounts, surrounded and exceeded by paraphyses, the asci $(14.4)-17-21-(25.5) \times 90-120~\mu$. Ascospores hyaline, when young divided into 2 4 cells, later dictyosporous with (6)-8-9 cells longitudinally and 2-3(-4) cells in width, the cells highly refractile, distichous, occupying almost all the ascus. The spores are more or less elliptical with broad rounded ends, and constricted at about the centre into two parts, the upper of which is slightly larger; surrounded by a thick gelatinous envelope, scarcely visible, $1.6-3.5~\mu$ thick, which appears to be divided transversely at the central constriction of the spore. Spores (including envelope) are $(9.6)-10.7-12.8-(16) \times 20-27-(34)~\mu$. In some specimens the envelope is dissolved, leaving a thin spore wall visible. Paraphyses surrounding and exceeding the asci in length, branched, intertwined, hyaline or pale coloured in mass near the apices, indistinctly septate, $1.4~\mu$ or less in width.

The species has apparently not been recorded before in the Union. The author is indebted to Dr. G. R. Bisby for identifying No. 36812 as this species. Dr. Bisby noted that the spores of this specimen were perhaps a trifle large for the species, but that it is known to be rather variable. The spores of No. 36994 agree well in size with those of European specimens.

This species was once found in association with Septonema spilomeum (in collection No. 36972), but this is probably fortuitous, since G. levantica is not known to produce S. spilomeum as an imperfect stage.

GLONIUM PARVULUM (Gerard) Saccardo, Syll. Fung. 2 (1883) 735; Ellis and Everhart, N. Am. Pyrenomycetes (1892) 682; Lohman in Pap. Mich. Acad. Sci. Arts and Lett. 13 (1931) 141-157, Ibid. 17 (1933) 248; Bisby in Mycologia 24 (1932) 326.

Hysterium parvulum Gerard in Bull. Torr. Bot. Club. 5 (1874) 40.

Illustrations: Lohman, l.c., Pl. 29, 30, 31; Text Fig. 5.

Collections: No. 36814, W. G. Rump, on dead wood, Pietermaritzburg district.

Hysterothecia dull black, straight, not striate, superficial, carbonous, very closely aggregated in lines almost touching each other, $0.4-1.1\times0.2-0.3$ mm., with narrow straight cleft. Asci cylindrical, narrow, sometimes bent, $3.3-4.4\times(41.5)-47-54-57$ μ , including a long indistinct basal "tail." Ascospores hyaline, 2-celled with deep median constriction, fusoid, $2.7-3.3\times6.5-8.7$ μ , the upper cell usually slightly larger. Paraphyses, hyaline, branched, septate, intertwined, filamentous, sometimes with a very small globose apex, about the same length as the asci, about 1.1 μ wide.

This specimen was kindly identified by Dr. G. R. Bisby, who wrote: "Rather immature, but I found some spores $6-8\times 2\cdot 5~\mu$ that were mature enough to escape from the asci. The fungus agrees closely with *Glonium parvulum* (Gerard) Sacc. described from North America and carefully redescribed by Lohman. It has been reported with some doubt from Europe."

HYSTERIUM INSIDENS Schweinitz, Syn. N. Am. 2078; Ellis and Everhart, N. Am. Pyrenomycetes (1892) 696; Bisby in Mycologia 24 (1932) 314 and 326; Lohman in Pap. Mich. Acad. Sci. 17 (1933) 262–266, f. 38.

Hysterographium insidens (Schw.) Saccardo, Syll. Fung. 2 (1883) 778.

Illustrations: Text Fig. 6.

Collections: Nos. 36957, 36943, 36993, P. H. B. Talbot, all on Acacia mollissima, Atholl Expt. Stn., E. Tvl., Feb. 1949...Locally abundant.

Hysterothecia black, carbonous, closely gregarious, often confluent along the sides, erumpent on wood and bark, linear, straight or curved, or short and navicular, $0.4-2.5 \times 0.4-0.5$ mm. Striations parallel to the cleft are evident. Asci clavate, octosporous, interspersed with branched, threadlike, hyaline paraphyses; the asci $120 \times 14.5 \mu$ (mature or nearly so). Spores uniformly brown with (5)-6-(7) cross septa, rounded at both ends, somewhat fusiform with the third cell usually larger than the others, and usually a constriction next to it, $6.58-9 \times 22.7-28.3-29.5 \mu$. In one collection the spores were mostly $7.6 \times 24 \mu$; in another $8 \times 24-27 \mu$. On the same piece of wood were larger hysterothecia with spores $9.6-12.8 \times 32-35-(40) \mu$.

Dr. G. R. Bisby kindly confirmed that "No. 36993 agrees very well on morphology with *Hysterium insidens*, as suggested." Lohman (1933, l.c.) found that American collections of this species produced *Septonema spilomeum* Berk. as a conidial state. Dr. Bisby later undertook ascospore cultures of No. 36993, and found that the same *Septonema spilomeum* state as produced in North America developed slowly on the culture plates of this South African material. He generously sent me part of the dried cultures, from which it was possible to establish the identity of some collections of *Septonema spilomeum* occurring naturally on *Acacia mollissima* at Atholl Experiment Station. A description of these collections follows.

SEPTONEMA SPILOMEUM Berk. in Hook. Lond. Jour. Bot. 4 (1845) 310, T. 12, Fig. 5; Cooke, Handbk. of Brit. Fungi 2 (1871) 481; Saccardo, Syll. Fung. 4 (1886) 399; Lohman in Pap. Mich. Acad. Sci. 17 (1933) 264–266, Fig. 38.

Illustrations: Lohman loc. cit; Text Fig. 7.

Collections: Nos. 36971, 36972, 36973, P. H. B. Talbot, on dead wood and bark of Acacia mollissima twigs, Atholl Experiment Station, E. Tvl., Feb. 1949. Locally abundant.

Sporodochia deepseated, usually gregarious but discrete and seldom coalescing, more or less hemispherical, $1-1\cdot 5$ mm. diam., pulvinate, dark reddy-brown to almost black, pulverulent. Conidiophores not readily distinguished from the lowest, least developed conidia, but dilutely coloured, minutely roughened, about $3\cdot 2$ μ diam. Conidia cylindrical or ellipsoidal, opaque, dark brown, in simple chains which occasion-

ally fork, at first transversely septate, usually with 4-6 transverse septa, slightly constricted at each septum and more so at the central septum, with rough, granular surface, $8-11-12\cdot 8\times 16-35\cdot 43~\mu$. The conidia are occasionally separated in the chain by a small colourless cell. Mycelium of the sporodochium is scanty, hyaline, infrequently septate, branched, filamentous, about $2~\mu$ diam.

Lohman (loc. cit.) emphasises that the conidia are progressively larger from the base to the apex of each filament, that the conidial filament is seldom oppositely branched, that the conidia are much constricted at the central septum, and that the terminal conidia are frequently muriform. She also notes that the isthmian chains are characteristic of the form genus *Polydesmus*, and the chains of muriform conidia of *Sirodesmium*. To judge by Linder's description and figures of *Bonordeniella aspera* [Linder in Mycologia 26 (1934) 439 and illustrations] it is possible that this is synonym of *Septonema spilomeum*, but the types have not yet been compared.

Dr. G. R. Bisby kindly confirmed the identification of No. 36972. He stated: "This specimen is like the type and other material of Septonema spilomeum from America—even to the colour. Kew has some fifteen specimens from the eastern United States and one from Australia; none from Europe (at least under the above name) where Hysterium insidens may be absent. I did not touch the type, which is now nearly bare, but your fungus is microscopically the same as Ellis 353, which Lohman says is the same as the type. It is easy to find spores $40~\mu$ long and up to $12.5~\mu$ wide in Ellis 353. The problem of the generic name to use cannot finally be settled until the types of Septonema, etc., are restudied. Meanwhile the binomial S. spilomeum can safely be applied to No. 36972."

HELICOMA CURTISII Berk. in Grevillea 3 (1875) 106; Linder in Ann. Mo. Bot. Gard. 16 (1929) 312 and 241, Pl. 21, f. 1-10; Pl. 30, f. 1; Pl. 31, f. 2.

Illustrations: Linder, loc. cit; Text Fig. 8.

Collections: No. 36998, P. H. B. Talbot, on Eucalyptus, Hennops River, Pretoria district, September 1948 (mixed collection); Nos. 36917, 36999, 37001, 37000, P. H. B. Talbot, on bark of Eucalyptus sp., Buffelspoort, Rustenburg district, 12/8/1948.

Fungus forming black discrete patches on bark, hirsute in appearance, brownish under the dissecting microscope. Conidiophores arising from the short dark mycelial cells which are little developed, erect, unbranched, septate, deep fuscous, lighter at the apex, which is rounded and tapered to a single sporogenous tooth, $136-178 \times 7-8\cdot 5~\mu$, slightly flexuous. Conidia hyaline to very dilutely coloured, coiled $1\frac{1}{4}$ times in one plane, 4-8 septate, $4\cdot 5-5\cdot 3~\mu$ thick, base tapering-rounded and slightly recurved, diam, of coil $13-17\cdot 5~\mu$.

In the collection No. 36917 the *Helicoma* was found in association with *Lasio-sphaeria pezizula* (B. and C.) Sacc. which Linder [in Ann. Mo. Bot. Gard. 16 (1929) 239-240] has shown to be its perfect stage. In both stages it is a new record for South Africa.

LASIOPHAERIA PEZIZULA (B. and C.) Sacc. Syll. Fung. 2 (1883) 195; Linder in Ann. Mo. Bot. Gard. 16 (1929) 314.

Sphaeria pezizula Berk. and Curt. in Grevillea 4 (1876) 106.

Herpotrichia pezizula (B. and C.) Ellis and Everhart, North American Pyrenomycetes (1892) 160.

Illustrations: Text Fig. 9.

Collections: No. 36917, P. H. B. Talbot, on bark of Eucalyptus sp., Buffelspoort, Rustenburg Dist. 12/8/1948.

Perithecia small, smooth, black, about 300 μ in diam., the walls composed of dark, polygonal cells. Perithecium globose with papillate ostiole, drying to a concave disc,

closely gregarious but not confluent. Asci $100-150 \times 20-24 \mu$, broad clavate, 8-spored, with marked hyaline thickening at the apex. Ascospores hyaline (becoming dilutely coloured), 5-7-(8) septate, straight, or more often slightly curved, almost cylindrical, tapering towards the ends to a rounded or somewhat pointed end, $41-56 \times 5 \cdot 5-8 \cdot 5 \mu$.

The identity of this, and its imperfect stage Helicoma curtisii, was kindly checked

at the Commonwealth Mycological Institute by Mr. E. W. Mason.

CINTRACTIA LEUCODERMA (Berk.) P. Henn. in Hedwigia 34 (1895) 335; Hennings in Fungi in H. Baum, Botanische Ergebnisse der Kunene-Sambesi Expedition, Berlin (1903) 156. Whetzel and Kern in Mycologia 18 (1926) 119-120.

Ustilago leucoderma Berk. in Ann. Mag. Nat. Hist. ii, 9 (1852) 200; Saccardo, Syll. Fung. 7 (1888) 460.

Illustrations: Whetzel and Kern in Mycologia 18 (1926) Pl. 16A.

Collections: No. 37002, P.G.C. Brett, on Rhynchospora cyperoides, S.A.S A. Experiment Stn., Mount Edgecombe, Natal, April 1949.

Sori $2\cdot 5-3\cdot 5$ cm. in length, surrounding the stem or peduncle of the grass, or forming elongated patches on these but not fully surrounding them. The stem or peduncle forms a central columella to the sorus. Sori are black inside, composed of a hard mass of agglutinated, not pulverulent spores, and white on the outside due to a thick white membrane which soon flakes off. The membrane is composed of fungous cells of a degenerated, gelatinous appearance under the microscope. The spores are deep brown with a thick browny-black, minutely warted epispore, and are subglobose to angular by compression, $14\cdot 4-16\times 16-19\cdot 2~\mu$.

This fungus has been reported on *Rhynchospora aurea* and *R. dolichostyla* from localities which include parts of tropical and East Africa, but not yet, it would seem, from South Africa itself, though it has been compiled in certain works dealing with South African Ustilaginales. [See Verwoerd in Ann. Univ. Stellenbosch 4 (1926) 22, and Zundel in Bothalia 3 (1938) 316.]

TRICHODERMA VIRIDE Pers. ex Fr., Syst. Myc. 3 (1829) 215; Persoon, Syn. Meth. Fung. (1801) 231; Bisby in Trans. Brit. Myc. Soc. 23 (1939) 149–168, Text Figs. 1–5. Illustrations: Bisby (1939) loc. cit.; see also references in Wakefield and Bisby, Trans. Brit. Soc. 25 (1941) 60.; Text Fig. 10.

Collections: No. 36808, P. H. B. Talbot, on prune agar cultures isolated from rotten potato leaves from Buffelspoort, Transvaal, 10/8/1948; No. 37003, C. van der Merwe, on soil and soil cultures from Kroondal Expt. Stn., Rustenburg, August, 1949.

Vegetative hyphae hyaline, 3-4-9 μ wide, thick-walled, branched, giving rise to the finer hyphal system from which the branched conidiophores arise. Conidiophores not easily distinguishable from the vegetative hyphae, $1\cdot7-3\cdot4$ μ wide, hyaline, septate, branched, usually with opposite branches arising at right angles from a characteristically swollen-node of the parent hypha, the branches producing terminal and lateral phialides on which the conidia are borne. Phialides shaped like a ninepin, straight or curved, arising singly or in opposite pairs, or in whorls of seldom more than three, $6\cdot5-9\cdot1\times2\cdot5-3\cdot4$ μ . Conidia abstricted from the phialides, unicellular, hyaline to pale bright greenish, globose, ovoid or broad elliptical, formed in slimy balls at the apex of each phialide, or occasionally in short chains. Conidia $3\cdot4$ μ diam., or $3\cdot4\times4\cdot6$ μ , smoothwalled. [Bisby (1939) mentions occasional inconspicuous roughenings of the spore wall.] Chlamydospores terminal or intercalary, subglobose to broad elliptical, very pale yellow, scanty, thick-walled, $8\cdot8-9\cdot6\times11\cdot2$ μ . Colonies on prune agar fluffy white to blue-green to deep green, with a marked smell of coconut.

This fungus is a common contaminant of culture plates at the Division of Botany and Plant Pathology, but as far as the author is aware has not been recorded or described from South Africa under its valid name. Records refer only to *T. lignorum* [see Doidge

and van der Plank in S.A. Dept. Agric. and Forestry Sci. Bull. No. 162 (1936) 23], which Bisby points out is invalid. No specimen of the fungus had previously been preserved in the National Herbarium at Pretoria. The Transvaal Chamber of Mines Timber Research Laboratory isolated this fungus from underground mine timber (T.R.L. 249) and from the coat of a native miner (T.R.L. 427). I am grateful to Dr. G. R. Bisby for confirming my identification of specimen No. 36808.

NIGROSPORA ORYZAE (B. and Br.) Petch in Journ. Ind. Bot. Soc. 4 (1924) 24.

Monotospora oryzae B. and Br. in Journ. Linn. Soc. Bot. 14 (1873) 99.

Illustrations: Mason, Annot. Account of Fungi Received at the Imp. Myc. Inst., list ii, fasc. 2 (1933) 53, f. 17. Compare also Mason in Trans. Brit. Myc. Soc. 12 (1927) Pl. 15, f. 1-9; Molliard in Bull. Soc. Myc. de Fr. 18 (1902) Pl. 9.;

Text Fig. 11.

Collections: No. 35552, G. J. M. A. Gorter, on Zea mays (Anveld var.), Prinshof, Pretoria, April 1946; No. 36992, G. J. M. A. Gorter, on Zea mays (inbred Hickory King), Potchefstroom Agric. Coll., June 1949.

Mould found in cobs and on the base of maize seeds, forming a thin hyphal web punctuated by dark purple-black spots which are the conidia. Hyphae creeping, septate, dilutely coloured to fuscous, up to 9 μ diam. (fide Mason, 1933, l.c. p. 55, they are 10–18 μ wide). Conidiophores inflated globose to ampulliform, borne laterally and terminally on a branched, septate mycelium which may become dilutely coloured. Conidia jet black, opaque, shiny, smooth, globose to broad elliptical depending on the angle of view, i.e., they are depressed spheres $(11\cdot4)-13\cdot7-(14\cdot8)$ μ , shot off at maturity.

Mason (1927) showed that the genus Basisporium Molliard was a synonym of Nigrospora Zimm. and that three species could be provisionally accepted on the basis of spore measurements, but not on the basis of hosts and geographical distribution. For the small-spored form on maize (Mason, 1927, p. 157-160) the name N. oryzae was suggested, and is accepted here. A form with larger spores was designated N. sphaerica (Sacc.) Mason. Mason (1933), p. 61) and Reddy [Agric. Expt. Stn. Iowa State Coll. Research Bull. No. 167 (1933) 5] both showed that in culture the large spored form tended to produce smaller spores. For that reason and the fact that both forms have the same host range and distribution, and also that Mason's studies did not include pathogenicity tests, Reddy included both forms under the name Basisporium gallarum Molliard. Durrell [in Agric. Expt. Stn. Iowa State Coll. Research Bull. No. 84 (1925)] preceded Reddy in attributing the dry rot of corn in the United States to B. gallarum. B. gallarum was first described by Molliard [in Bull. Soc. Myc. de Fr. 18 (1902) 167-170], and is not to be confused with the soil isolation named B. gallarum by Dale [in Ann. Myc. 10 (1912) 466] which was renamed Monotospora daleae Mason (Mason, 1933, loc. cit. p. 50, Pl. 16).

Mason's studies (Mason, 1927, l.c.) clearly indicated that the fungus in question is congeneric with Nigrospora Zimm. It appears desirable in recording this fungus as new to South Africa to place it in the genus Nigrospora, and, as the small-spored form, it is recorded as N. oryzae. If it should subsequently be established that N. sphaerica and N. oryzae are cospecific no harm is done, for the latter epithet has priority and will stand. (Monotospora oryzae B. and Br., 1873; Trichosporium sphaericum Sacc. 1882.)

TORULA HERBARUM (Pers.) Link ex Fries; Fries, Syst. Myc. 3 (1829) 501; Link in Magaz. Ges. Naturf. Freunde Berlin 3 (1809) 21; Saccardo, Syll. Fung. 4 (1886) 256; Massee, Brit. Fung. Flora 3 (1895) 362; Ferraris, Flora Italica Cryptogama, Pars. 1 Fasc. 8 (1912) 224; Mason, Annot. Account of fungi received at the Imp. Myc. Inst. List ii Fasc. 3 (special part) (1941) 113-117, Figs. 33, 34.

Monilia herbarum Pers., Syn. Meth. Fung. (1801) 693.

Septonema toruloides Berlese in Bull. Soc. Myc. de Fr. 8 (1892) 103, Pl. 10, Figs. 18-20.

Illustrations: Berlese, loc. cit.; Mason, loc. cit.; Text Fig. 12.

Collections: No. 36929, P. H. B. Talbot, Hennops River, Pretoria district, Oct. 1948.

Pulvinate to effused, black with an olivaceous tinge, pulverulent. Repent hyphae superficial or just within the substratum, fuscous, septate, branched, $1\cdot5-3$ μ diam., giving rise to laterally borne conidiophores. Conidiophores short, inflated, subglobose, smooth, thin-walled, $4-4\cdot8$ μ diam., single, sessile or on a very brief stalk. Conidia in chains which are typically much branched, fuscous, minutely spinose or smooth under the oil immersion lens, each conidium composed of 3-6-(20 or more) subglobose cells, with constrictions at the septa; width 5-6 μ ; the apical cell of each conidium commonly the lightest in colour and smaller than the others.

Mr. E. W. Mason very kindly determined this species, and commented: "Almost exactly the same as Wallace No. 1507 on Zea mays from Tanganyika. . . . Many of the chains are formed exclusively of short conidia, 3-6 celled; but some preparations show conidia of 20 or more cells. The breadth of the conidia is mainly between 5 and 6 μ diam. Except for these long conidia it is almost exactly the same as a soil isolation from Great Britain kept in the culture collection, but in that the longest conidium so far seen consists of only 8 cells."

LACELLINA GRAMINICOLA (B. and Br.) Petch in Ann. Roy. Bot. Gard. Peradeniya 9 (1924) 171; Hopkins in Mem. Dept. Agric. S. Rhodesia No. 2 (1939) 6.

Chaetopsis graminicola Berk, and Br. in Journ. Linn. Soc. Bot. 14 (1875) 90.

Mesobotrys graminicola (B. and Br.) Sacc., Syll. Fung. 4 (1886) 325.

Gymnosporium einctum B. and Br. in Journ. Linn. Soc. Bot. 14 (1875) 90,

Coniosporium cinctum (B. and Br.) Sacc., Syll. Fung. 4 (1886) 243.

Illustrations: Text Fig.13

Collections: No. 36996, P. H. B. Talbot, on dead leaves of Miscanthidium junceum, Rustenburg Kloof, Transvaal, 24/5/1949.

Colonies dense black, velutinous, superficial, elliptical or oval, discrete, rarely coalescing, up to 1×2 mm. Setae present, numerous, unbranched, smooth-walled, opaque, black-brown at the base becoming paler and pellucid near the rounded apex and there revealing septa, $9\cdot6-15\times 500-700~\mu$. Conidia fuscous, subglobose to broad elliptical or ovate (flattened in one plane) with rather thick walls, smooth when mature, minutely sculptured when young, $4\cdot6-6\cdot2-(6\cdot6)\times (5\cdot4)-6\cdot2-6\cdot9-(7\cdot3)~\mu$. A few outsize conidia $4\cdot6\times 8\cdot5-9\cdot6~\mu$ are present. Conidia borne terminally and laterally in evanescent chains and groups, easily becoming detached as a fuliginous powder. Conidiophores sub-hyaline or pale golden brown, $3\cdot5-4\cdot8~\mu$ wide, thick-walled, with strongly verrucose walls, sparingly branched, suberect, the apex often swollen or expanded and appearing shortly moniliform owing to the presence of young catenate conidia, arising from a sparse repent mycelium of the same appearance and all forming a loose network surrounding the base of the setae.

This interesting species is a new record for South Africa, though it is known from Rhodesia. The author was forunate in being permitted to borrow Dr. Hopkin's Rhodesian material to study (Myc. Herb. Dept. Agric. S.R. No. 2308, on *Aristida* sp., leg. J. C. Hopkins, Salisbury, 1/3/1933). The colonies in Dr. Hopkin's specimen were somewhat smaller (0.5-1 mm. diam.) and the setae less pointed at the apex, but in all other particulars there was very close correspondence of characters and measurements.

To make sure of their identity these specimens (*Hopkins*, 2308 and *Talbot*, 36996) were sent to the Commonwealth Mycological Institute. Mr. M. B. Ellis very kindly compared them with authentic material of *Lacellina graminicola* (*Thwaites* 505), and

stated that there seemed to be no doubt that they matched this species. Mr. Ellis reported: "... the conidia are flattened in one plane, smooth to verruculose, pale brown 5-7 (5·7) $\mu \times 3$ -4 μ (measured in lactic acid) and are borne on subhyaline or pale golden-brown rough-walled conidiophores which are 3-4 μ in diameter. The setae are dark brown, 11-15 μ in diameter at the base and 10 μ about the middle; in Thwaites 505 they vary in length from 300-1,200 μ , in your material (Dr. Hopkin's) from 270-700 μ plus (most of the setae have had their tips broken or eaten off). . . Although we have not been able to examine material of L. libyca Sacc. and Trott. it is quite likely that this again is the same thing."

Lacellina libyca Sacc. and Trott. [in Ann. Myc. 11 (1913) 419; Saccardo, Syll. Fung. 25 (1931) 781] is obviously closely related and in fact the author first disposed his collection as this species. As the above measurements will show, there is a good deal of variation in the size of the conidia and setae which may indicate that the two species intergrade.

Petch states that the conidia form groups and chains only accidentally after abscission. My observations support the view of Saccardo and Trotter that the conidia are in evanescent chains or groups before abscission. The young conidia, still attached, are clearly connected by isthmi, while if a colony is inverted over a slide and tapped gently the conidia fall onto the slide still retaining their positions in groups and short chains.

GONATOBOTRYS RAMOSA (Karst.) Reiss in Fresenius Beitr. ii 44 (1852) Tab. 5, Fig. 22-23; Saccardo, Syll. Fung. 4 (1886) 169; Lindau in Rabenh. Krypt. Fl. Band. 1, Abt. 8 (1905) 357.

Glomerularia ramosa Karst. in Bot. Zeit. 7 (1849) 368, Tab. 6, Fig. V., p. (fide Lindau).

Illustrations: Text Fig. 14.

Collections: G. J. M. A. Gorter, on germinating seeds of Zea mays in the laboratory. Pretoria, 17/3/49.

Colonies white, composed of arachnoid or densely interwoven hyphae and conidiophores. Repent hyphae hyaline, sparsely branched, septate, $2 \cdot 6 - 5 \cdot 3 \mu$ diam. Conidiophores erect, very long, slender, very rarely branched, hyaline, septate, up to 660 μ long and 4-8 μ wide, bearing always at the apex, and sometimes at the penultimate cell as well, or irregularly distributed, a slightly swollen area covered with numerous spicules on which the conidia are borne. The spicules are cylindrical with rounded apex and up to $5 \cdot 3 \mu$ long by 2μ wide. Occasionally in the swollen conidium-bearing areas are short lateral vescicular branches of the conidiophore which also bear a few sporogenous teeth. The conidia are ovate to elliptical and basally apiculate, hyaline, thin-walled, large, $(10 \cdot 4) - 11 \cdot 2 - 12 \cdot 8 \times 17 \cdot 6 - 22 \cdot 4 \mu$, smooth.

This interesting species was noticed by Mr. Gorter and subsequently sent by him to the Centraalbureau voor Schimmelcultures at Baarn, for determination. Unfortunately no specimen was preserved in the Herbarium in Pretoria, and further attempts to isolate the fungus from maize seeds failed.

ACREMONIELLA ATRA (Corda) Saccardo, Syll. Fung. 4 (1886) 302; Lindau in Rabenh. Krypt. Fl. Band 1, Abt. 8 (1906) 675; Mason, Annot. Account of Fungi received at the Imp. Myc. Inst., List ii, Fasc. 2 (Special Part) (1933) 29–39,

Fig. 11; Bainier in Bull. Soc. Myc. de Fr. 23 (1907) 237, Pl. 18.

For synonymy see Mason, loc. cit.

Illustrations: Text Fig. 15.

Collections: E. E. Schaefer, cultures from seeds of Zea mays from Onderstepoort, Pretoria, August, 1949.

The aleuriospore stage of this fungus was found by the writer in cultures made from maize seeds, in which there was a preponderance of other mould species. The stage showing aspergilliform phialospores (see *Papulaspora aspergilliformis* illustrated by Bainier in Bull. Soc. Myc. de Fr. 23 (1907) pl. 18] was not seen, and attempts to get the fungus into pure culture failed. The aleuriospore stage is briefly described below.

Hyphae branched, hyaline, septate, whitish, $2\cdot 5-5$ μ diam. Aleuriophores formed as lateral branches from the hyphae, hyaline, tapering to a point at the apex, occasionally branched, septate, $44-53\times5\cdot3-6\cdot6$ μ , bearing a single spore at the apex. Aleuriospores obovate or elliptical, light cinnamon brown, smooth, $21\cdot3-28\times13-16-20$ μ .

TRICHURUS GORGONIFER Bainer in Bull. Soc. Myc. de Fr. 23 (1907) 229–234, Pl. 25, Figs. 1–6; Saccardo; Syll. Fung. 22 (1913) 1452.

Illustrations: Bainier l.c.; Text Fig. 16.

Collections: No. 39188, C. O'Connor, contaminant on peanut husk cultures, March, 1949; No. 39189, E. E. Schaefer, contaminant on potato slice culture, March, 1949; No. 39190, L. Kresfelder, contaminant on peanut husk culture, August 1949; No. 39197, P. H. B. Talbot, contaminant on prune agar culture, Sept. 1949. All these collections were made at the Division of Botany and Plant Pathology, Pretoria.

The fungus arises as a web of whitish then pale cinereous or pale violaceouscinerous mycelium interspersed later with synnemata. The synnemata are 1 · 2-2 mm. in length, the width of the fertile head being $80-140 \mu$ and that of the sterile part of the stalk being 40-48 \(\mu \). The fertile head is cylindrical to clavate, and in gross appearance is pale cinereous, violaceous-cinereous or later becoming ashen or pale brownish in colour. The stalk is blackish brown. The synnemata are usually unbranched, but frequently in some cultures they are branched. They arise singly or in groups direct from the mycelium or from a thick mycelial strand or even from peculiar balls of hyphae resembling sclerotia but soft, subglobose or irregular in shape, brown, 160-290 μ in diam. The stalk of the synnema is composed of parallel hyphae, closely united, brown, septate, $2-4\cdot3$ μ in width and irregular in width along short pieces of a single hypha. Mycelial hyphae are similar, $1.6-4.4 \mu$ wide. In the fertile part, the synnema hyphae have terminal or lateral branches which bear very compact penicillate structures terminating in phialides and chains of conidia. Such penicillate structures may also originate from the mycelial hyphae before the formation of synnemata. The phialides are dilutely coloured, $2 \cdot 7 - 3 \cdot 3 - 4 \cdot 3 \times (5 \cdot 5) - 7 \cdot 6 - 10 \cdot 8\mu$. The conidia are catenate, easily becoming separated, ovoid or broad elliptical, very dilutely coloured, (2.7)- 3.3×4.4 -(4.9) μ . In a mass they are pale violaceous-cinereous, later ashen or pale brownish. Arising as branches among the penicillate phialides are numerous long, unbranched, septate, dilutely coloured, straight or undulate or curved (but not coiled) hairs, varying in width from (3)-5.5 μ , with rounded apex, and 55-150 μ in length.

The sterile hairs arising from the fertile part of the synnemata are characteristic of the genus *Trichurus*, and distinguish it from *Stysanus*. Bainier (l.c.) has compared three species of *Trichurus*, and our collections agree very well with his description of *T. gorgonifer*. The fungus grows readily on a medium composed of peanut husks and wheat grains, used for the culture of *Phytophthora*, where it was first noticed and brought to my attention by Miss C. O'Connor.

PASSALORA GRAMINIS (Fuckel) v. Höhnel in Centralblatt für Bakt. 60 (1924) 6; Sampson and Western, Diseases of Brit. Grasses and Herbage Legumes (1941) 22, text Fig. 6, Pl. 3, Fig. 6.

Scolecotrichum graminis Fuckel Symb. Mycol. (1869) 107; Johnson and Hungerford in Phytopath. 7 (1917) 69; Wakefield and Bisby in Trans. Brit. Myc. Soc. 25 (1941) 87.

Illustrations: Sampson and Western, loc. cit.; Text Fig. 17.

Collections: No. 39198, comm. S. J. Truter, on Dactylis glomerata, Riversdale Farm, Himeville, Natal, January, 1950.

Fungus forming numerous very small chocolate-brown spots on both sides of the leaves, the infected parts of the leaves crinkling and withering. The spots are composed of very densely fasciculate conidiophores which are brown coloured, straight, curved or slightly geniculate, unbranched, obscurely septate near the apex, $(4\cdot6)-6\cdot6\times70-80~\mu$, with a single apical scar. Conidia lightly coloured, 2-celled, the upper cell frequently somewhat narrower and more elongated than the lower, both cells tapering towards the ends, the basal one marked with a very distinct scar, smooth, borne apically on the conidiophores, $10-11\cdot3\times36~\mu$.

Sampson and Western (l.c.) figure conidiophores with more than one conidial scar, and the assumption is that the conidia may be produced acropleurogenously, though in the present material only acrogenous conidia were found in a mature state. In some of the young conidiophores two lobes were seen at the apex, one representing a very young conidium and the other the growing tip of the conidiophore. Thus there appears to be little doubt that in our material more than one conidium per conidiophore may be produced. *Passalora graminis* is a new record for South Africa.

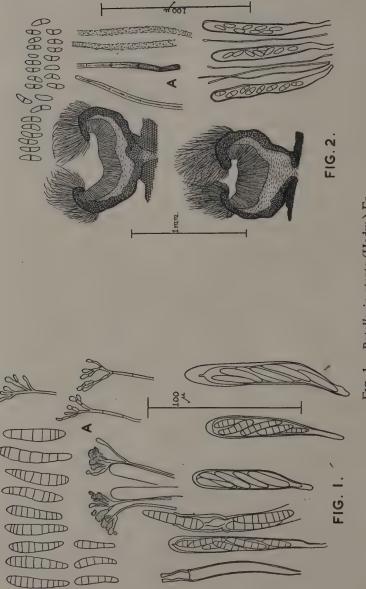


Fig. 1,—Patellaria atrata (Hedw.) Fr. Paraphyses are shown at A.

Fig. 2.—Perrotia flammea (Alb. and Schwein.) Boud.
At A is a group of hairs from the outside of the apothecium, those on the right showing the granular incrustation.

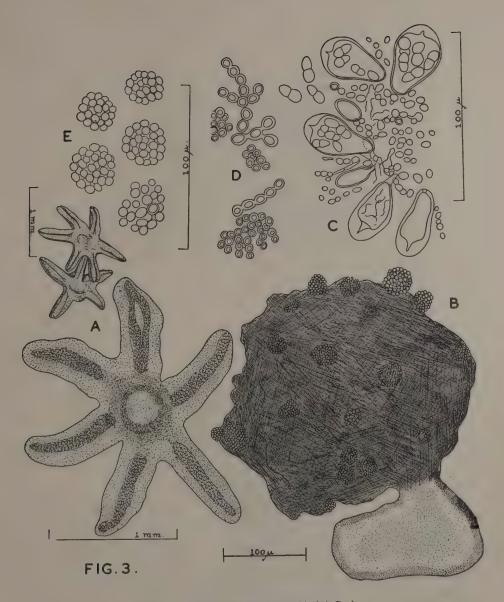


Fig. 3.—Atichia glomerulosa (Ach.) Stein.

A—Stellate colonies. B—Globular colony. C—Asci and ascospores. D—Yeast-like cells composing the thallus. E—Groups of conidia, i.e., "propagula."

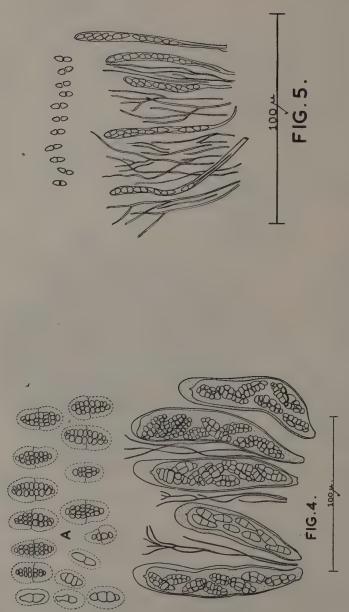


Fig. 4.—Gloniopsis levantica Rehm.

4—Ascospores, showing the thick investment of each spore.

Fig. 5.—Glonium parvulum (Gerard) Sacc.
Asci, ascospores and paraphyses.

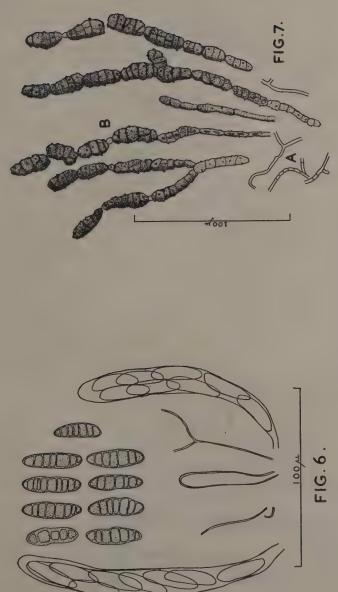
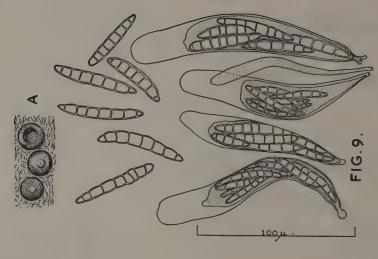


Fig. 6.—Hysterium insidens Schwein. Asci, ascospores and paraphyses.

A—Hyphae of the sporodochia. B—Chain of conidia separated at B by a small isthmus cell.



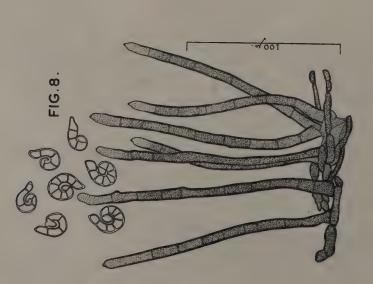
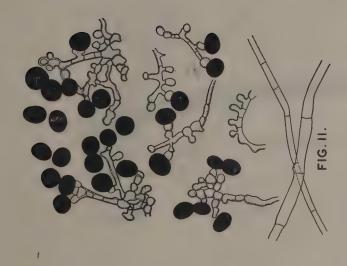


Fig. 8.—Helicoma curtisii Berk, Conidiophores and conidia.

Fig. 9.—Lasiosphaeria pezizula (B. and C.) Sacc. Asci and ascospores. The habit of the fungus on bark is shown at A.



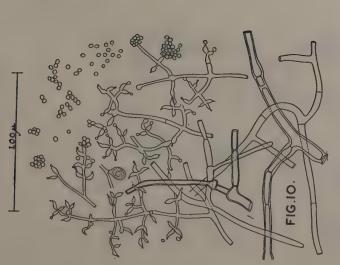


Fig. 10,—*Trichoderma viride* Pers. ex Fries. Hyphae, phialophores, phialides and conidia.

Fig. 11,—Nigrospora oryzae (B. and Br.) Petch. Hyphae, conidiophores and conidia.

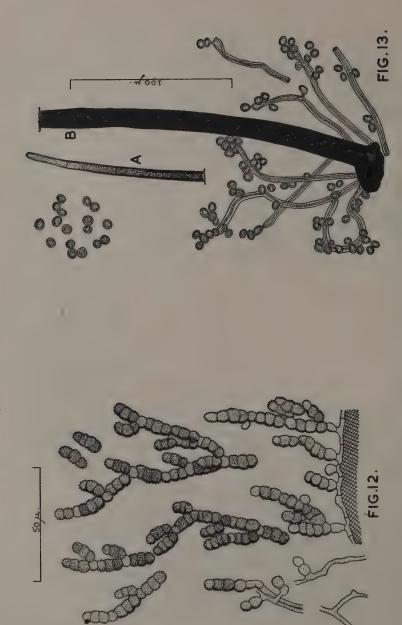


Fig. 12,—Torula herbarum (Pers.) Link ex Fries. Conidiophores and branched chains of conidia.

Conidiophores, conidia and setae. A shows the apex, and B the base of a seta. Fig. 13.—Lacellina graminicola (B. and Br.) Petch.



Fig. 14.—Gonatobotrys ramosa (Karst.) Reiss. Conidiophores and conidia.

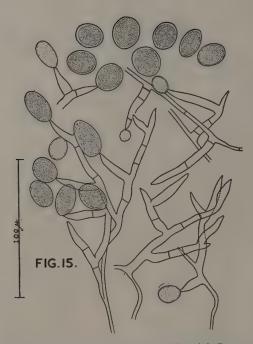


Fig. 15.—Acremoniella atra (Corda) Sacc. Aleuriospores and aleuriophores.

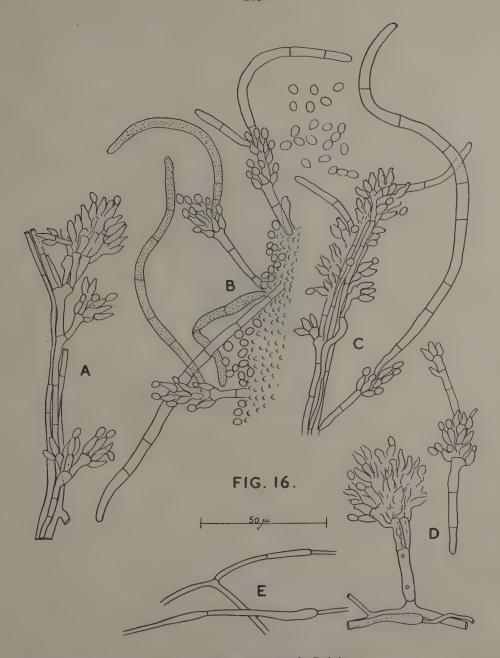


Fig. 16.—Trichurus gorgonifer Bainier.

A, B and C show parts of the synnemata including penicillate structures, phialides, sterile hairs and conidia; D shows penicillate structures arising direct from the mycelium; E—Hyphae.

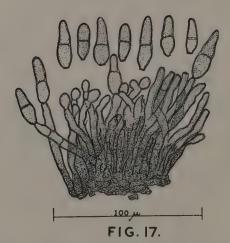


Fig. 17.—Passalora graminis (Fuckel) v. Höhnel. Conidiophores and conidia.

Encephalartos Natalensis.

R. A. Dyer and I. C. Verdoorn.

Encephalartos natalensis *Dyer* and *Verdoorn*, sp. nov., ab *E. altensteinii* Lehm. inter alia foliolis majoribus infimis spinosis reductis ab *E. woodii* Sander foliis haud valde arcuatis truncis minus robustis differt.

Planta e base ramosa truncis usque ad 6.5 m. cylindricis plus minusve 40 cm. diam. Folia stricta vel apicem versus aliquot recurva, 1.3-3.2 m. longa, usque 37 cm. lata, foliolis infimis spinosis reductis; pulvinus bruneo-lanatus, 3 cm. crassus, 4 cm. latus et 5 cm. longus; pedunculus glaber usque ad 26 cm. longus; foliola rigida, late lanceolata vel basin versus asymmetrica, 16-23 cm. longa, 2.5-4.5 cm. lata, marginibus integris vel utrinque 1-5 spinosis. Strobilus masculinus circiter 45 cm. longus, 9.5 cm. diam.; squamae circiter 4 cm. longae. Strobilus femineus 48 cm. longus, 24 cm. diam.: facies squamarum 3 cm. prominentes, rugosi, apices versus constricti et umbilicos truncatos producti, apicibus plus minusve rhomboideis 1.4 cm. latis concavis dense lanatis. Semina scarlatina, 5 cm. longa, 2 cm. diam.

NATAL.—Valley of Thousand Hills, in kloof, old female plant, *Dyer* 4475 (type); *Verdoorn* and *Christian* 713, 713a; *Dyer* and *Verdoorn* 2367; 2368; 2370; 2371 (all from same plant as type specimen); young plant; *Dyer* 4476; *Verdoorn* and *Christian*, 713b; *Dyer* and *Verdoorn* 2369; plant on ledge of krantz, *Dyer* 4477; near Inchanga, *Ducasse* (male cone); Railway Nursery on lawn, *Verdoorn* and *Christian* 713c.

Plates I, II and III.

The following specimens are probably conspecific but further research is required in the native habitats. Common in Karkloof River Valley below Howick Falls; Bayer S. 7; Dyer and Codd 4785; Krantzkop, overlooking Tugela River Valley, Verdoorn and Christian 714: Crundall.

Plant branched from the base to form a clump of several stems of unequal length; stems eventually attaining a height of about 6.5 m. (20-22 ft.) and 40 cm. (15 in.) diameter, more or less cylindrical, covered with compact leaf bases, the scars of which are about 6.5×5 cm. $(2\frac{1}{2} \times 2 \text{ in.})$. Leaves in a moderately dense crown, erect-spreading, sometimes slightly twisted and recurved towards the apex, 1·3-3·2 m. long, up to about 40 cm. broad; pulvinus woolly-tomentose about 3 × 4 cm. thick and 5 cm. long; peduncle tomentose at first, glabrescent, 10-26 cm. long up to the lowest prickle; leaflets spreading or forming a broad V at the base and an acute V towards the apex, dark grass-green, shining on surface, paler and not glossy below, with veins not apparent on face but visible on back, glabrous, hard and rigid, the medial broadly lanceolate, 16-23 cm. long, 2·5-4·5 cm. broad, tapering to the hard pungent or subpungent sometimes decurved apex, very obtuse symmetrical or asymmetrical above the base, narrowed to 1-1.2 cm. and with line of attachment 1.4-1.8 cm. long; the leaflets towards the apex reduced in size to about 10 cm. long, 1.5 cm. broad, with the basal ones reduced in length, but little in breadth until they become reduced to prickles; margin a hard rim entire or with 1-5 sharp teeth on one or both margins, more often on lower leaflets where the teeth may be slightly to distinctly lobate. Male cone (from plant in veld) about 45 cm. long, 9.5 cm. diam.; scales (dry) from middle section of cone about 4 cm. long with the sporangial surface narrowly obovate-oblong about 2.7 cm. long, 1.8 cm. broad at top and 1 cm. broad at base, terminating in a flat or slightly excavate rhomboid beak; shoulders of scale acutely ridged, entire, rarely bluntly toothed; beak with grey or foxy pubescence with the rhomboid top 8 × 7 mm., the lower edge of which protrudes slightly (though more markedly so in scales towards apex of cone) the upper edge rounded with a small hump about the middle; the basal scales shorter and broader and much smaller near the top of the peduncle. Female cone (from type specimen)

up to about 50 cm. long, 25 cm. diam.; scale faces (as seen on fresh cone) prominent, rough with an elevated brown woolly rhomboid apical beak; scales from middle section of cone (removed from cone) with a stripe about 4 cm. long, yellowish, side arms from shoulders about 2 cm. long, with the shoulders 3-cornered, toothed on margins; scale face 5 cm. broad at base and 4 cm. high, rough with prominent blunt rugosities, lateral angles obtuse, lower and upper angles rounded or humped, constricted near apex and produced into a short truncate slightly concave umbilicus covered with brown wool. Seed scarlet, 5 cm. long, 2 cm. diam.

The description under a new name of such a well-known plant as the giant cycad in the Valley of the Thousand Hills, near Inchanga, Natal, requires explanation. Until now it has been classified under the species Encephalartos altensteinii, which has its headquarters in the coastal area of the eastern Cape Province from the banks of the Bushmans River to Kei River. Hutchinson and Rattray [in Fl. Cap. 5; 2:40 (1933)] took a broad view of the limits of E. altensteinii to include the arborescent forms in Natal, and some in the Transvaal separated earlier by Stapf and Burtt Davy under the name E. transvenosus. Hutchinson's protected himself, however, by pointing out that they had not seen specimens from either Natal or the Transvaal. It follows from our present action that we do not hold with Hutchinson's and Rattray's view, although admitting that the differences relied on for specific separation may not be very convincing to others. In a footnote to E. altensteinii in Flora Capensis attention is drawn specially to the fact that the lower leaflets are not reduced to prickles in E. altensteinii. One of the features of the plant in the Valley of a Thousand Hills, near Inchanga, is the almost invariable reduction of the lower leaflets to prickles. The leaflets of E. natalensis on the average are appreciably broader, especially the lower ones, than in E. altensteinii and the texture is more rigid and the colour a darker green. In addition the plants may become somewhat larger and branching from the base is more of a feature in the Natal species than of those in the Eastern Cape Province.

One further consideration which favours the separation of *E. natalensis* is in the apparent break in the distribution range between *E. altensteinii* and *E. natalensis*, neither being recorded, so far, from the Transkei area.

E. natalensis is readily distinguished from E. transvenosus in that the leaflets of the latter are lighter green, more curved-spreading and have an indumentum on the surface which persists for some considerable time. E. woodii, only known from one or two male clumps in the wild state, differs in its more robust trunk (which broadens somewhat at the base) and the long, regularly curving and later drooping leaves with larger and generally more leathery leaflets.

Henderson in the Journal of South African Botany, 1945, accepts the Inchanga plant as part of his *E. altensteinii*, but like Hutchinson had not seen material from the wild in Natal. He separated, however, *E. transvenosus* from synonymy in Flora Capensis and also maintained *E. woodii* as a distinct species.

Only three specimens, all female, of *E. natalensis* have been examined by the authors in the Valley of the Thousand Hills. Part of an old male cone, brought by a Native to the gardener of the Railway Nursery, and a male plant. on the lawn of the Railway Nursery cottage, said to have come from the neighbourhood, were used for the description of the male plant. Although there were probably more specimens in the wild formerly it could not have been common in the immediate vicinity within living memory. The three female plants studied in the wild near Inchanga are: (a) a large old specimen with several stems in a steep, densely wooded kloof; (b) a young unbranched plant about 3 ft. high nearby; and (c) a medium-sized plant, branched from the base (tallest trunk 9 ft.) situated on the mountainside below a krantz about half a mile distant from the other two. It will be seen from the specimens cited that plants at Howick Falls are regarded as probably conspecific and others in the Krantzkop area have been placed with them, but all require further close study for several seasons in the field, which it has not been possible to do as yet.

To give further details of (a) there were in November, 1949, not less than 11 well-developed trunks in the clump and several suckers which had not risen above ground. The tallest trunk was about 20-21 ft. above ground level and the diameter was near a mean of 15 in., the other trunks being all fairly uniform in diameter. Viewing the clump from the side with the upper aspect of the kloof on the left: on the upper side there are 3 erect trunks varying from 10-14 ft. in height and two broken trunks, one being 3 ft. long, hollow at the top and the other 5 ft. long with a branch about 6 ft. long from its top spreading horizontally with upturned crown. On the lower side of the main trunk were 5 subsidiary trunks, the longest 15 ft., spreading nearly horizontally from near the base and with upturned crown, one trunk about 8 ft. tall and three shorter.

The stem of the young plant (b) nearby was about 3 ft. tall, up to about 18 in. diam., with larger leaves and leaf bases and showing obvious signs of far more rapid growth than the old plant.

Speculation on the age of living cycads, often referred to as living fossils, has been indulged in by many people interested in botany. Estimates have varied very widely but almost invariably, we feel, on the generous, even excessive side. So far no scientific method of calculation has been devised, since the trunks are fibrous and exhibit no such character as annual rings.

Some idea of the age of cycads might be judged from the number of leaf scars on the stem, but so far it has not been determined with what regularity whorls of leaves are produced. The available information shows that new whorls of leaves are not necessarily produced annually, in fact this is likely to prove exceptional in adult plants. One cannot judge the average rate of growth from observations made during a short period. There is a comparatively wide gap at the apex of the stem between two successive whorls of leaves, but the gap between the leaf bases of the whorls decreases as further growth extends them to the maximum circumference of the trunk. Thus leaf bases of two adjacent whorls may be 6 in. apart at the apex of the trunk but later in the life of the trunk the same whorls may almost merge into each other.

Meagre records allow of an early growth rate in arborescent species, such as E. natalensis of 2-3 ft. in the first 30-50 years, but this rate would not be maintained even in unbranched specimens.

In the case of the old plant (a) the estimation of age becomes a guess at a minimum because of the fact that it is branched from the base and a succession of suckers down to embryonic size is present to continue growth when the older branches die of senile decay or accident. The present tallest stem of about 20 ft. in height may well have been a sucker far removed in succession from the original parent but we have no means of telling. In addition to the normal retardation of growth rate with age, the rate of growth of each of a group of stems from one root is almost certainly slower than a single stemmed plant, and so to hazard a guess the age of the largest branch of the matriarch is something upwards of 250 years and of the rootstock itself possibly more than 1,000 years (in keeping with the name of the valley in which it grows). If this old plant and the young plant (now 30 50 years old) and our botanical records persist for another 1,000 years, posterity will have some factual evidence to fall back on.

In this connection it is most gratifying to record that Dr. Seele, the owner of the ground surrounding the old and young female plants, has very generously and wisely set it aside as a park in his newly surveyed township of Monteseel. In addition the matriach type specimen of *E. natalensis* is to be declared a national monument.

It stands in a boulder strewn clearing surrounded by low forest. The vegetation has regained some of its former luxuriance since its comparatively recent protection from grazing animals.

APPENDIX.

After the above account had gone to press it was possible to make a further visit to the three plants (a), (b) and (c) mentioned above. With the assistance of Professor A. W. Bayer and Dr. C. R. C. Heard of the Natal University, measurements were taken on 19/2/51. The height of the tallest stem of the old plant (a) was 19 ft. 9 in., which shows that previous estimates were too high. Even now one cannot say from how far underground the tallest stem arises, but a spot was selected at the base of the plant for the present measurements and from which to take all future measurements.

Photographs were taken to fix the position of all existing branches—eleven in all, excluding the basal suckers which have not risen above the leaf-mould. The total circumference round the base of the clump is 26 ft. 11 ins.

PLANT (a) (11 STEMS).

	Height.	Circumference
		(breast high
(1)	9 ft. 10 ins	3 ft. 10½ ins.
(2)	9 ft. 11½ ins	4 ft. 0 ins.
(3)	7 ft. 1½ ins	3 ft. 5- ins.
(4)	19 ft. 9 ins	3 ft. 9 ins.
(5)	15 ft. 4 ins	
(6)	8 ft. $2\frac{1}{2}$ ins	
(7)	10 ft. 0 ins	4 ft. 4 ins.
(8)	8 ft. 5 ins	
(9)	7 ft. 8½ ins	
(10)	5 ft, 6 ins	
(11)	\[\begin{align*} \int & \text{ft. 4 ins. (base)} \ldots \\ \int & \text{ft. 0 ins. (branch)} \ldots \\ \]	3 ft. 6 ins.

PLANT (b) (YOUNG UNBRANCHED FEMALE).

Height.	Circumference.
3 ft. 7 ins. (above firm humus) 3 ft. 10 ins. (to corner of adjacent rock)	4 ft. 6 ins.

This young plant is obviously making rapid growth by comparison with the branches of the old female (a).

PLANT (c) (SEVERAL STEMS).

Height (Tallest stem on north side).	Circumference.
11 ft. 5 ins. total: 8 ft. 3 ins. (above rock ledge) 3 ft. 2 ins. (below rock ledge).	3 ft. 11½ ins.

The circumference of the whole plant at base was 22 ft.



Plate I.—Encephalartos natalensis. Old female plant (a) in text, showing the group of erect stems and the large one on the right spreading down hill (1945).

210



Plate II.—Encephalartos natalensis. Top, old female (a) in text showing relative size of whole clump of stems (1945); bottom, male cone taken from plant on lawn near railway nursery cottage, Inchanga.

[Photo H. King.]

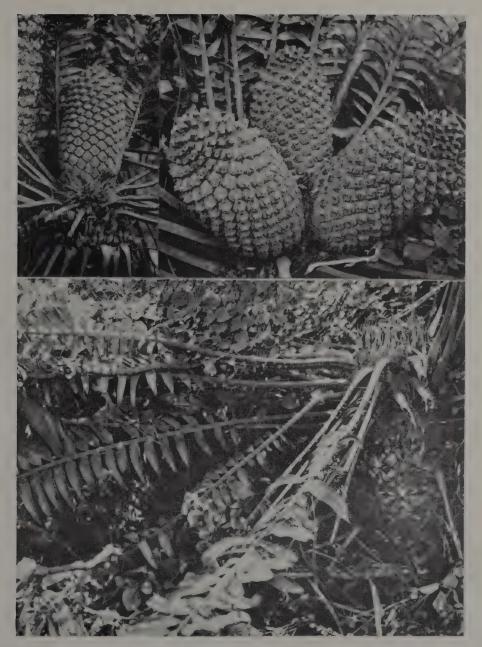
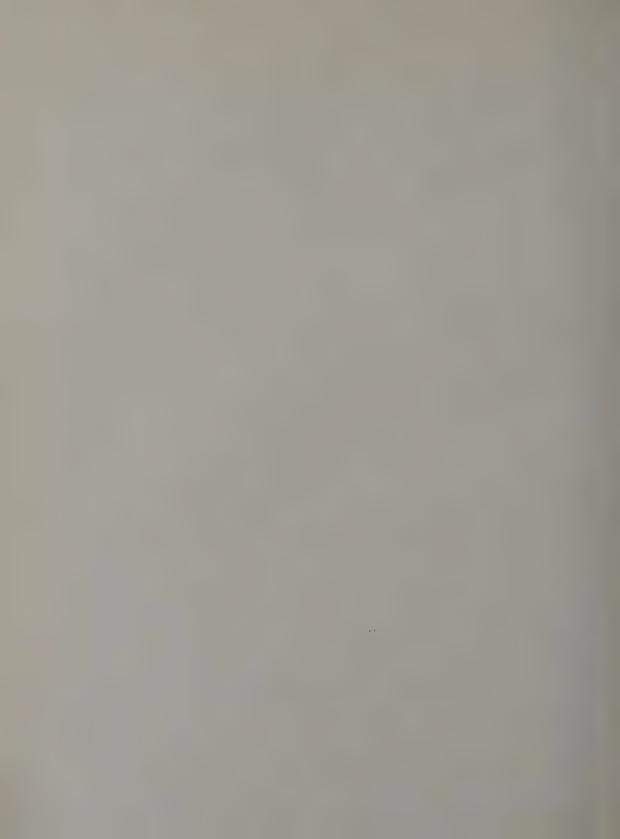


Plate III.—Encephalartos natalensis. Top left, cone from medium sized trunk of old female plant, (a) in text, showing wide space between consecutive whorls of leaves while the portion of old trunk on its left shows how congested leaf bases become with age (1945); top right, cones from young female plant, (b) in text (1947); bottom, young female plant (b) in text (1949).



Newly Described Species

By

E. A. Bruce, A. Brueckner, R. A. Dyer, P. Kies and J. C. Verdoorn. ASCLEPIADACEAE.

Ceropegia decidua E. A. Bruce, sp. nov. (Asclepiadaceae); affinis C. caffroro Schltr., sed foliis deciduis, tubo corollae intus basi tuberculato, corona exteriora cupuliforme columnam staminum multo superantia valde distincta.

Herba volubilis, usque 40 cm. longa, basi ramosa; ramis minutissime scabridulis basi 1.5 mm. diam., internodiis 1-4 cm. longis inferioribus brevioribus; tuber depressosphaericum, circiter 3 cm. diam. Folia decidua, oblongo-ovata, vel ovata, patentia, carnosiuscula, apice rotundata et apiculata vel abrupte et breviter acuminata, basi rotundata, I 1.8 cm. longa, 0.4 1 cm. lata, margine et subtus basin versus pilis paucis albidis ornata; petiolus circiter 3 mm. longus. Cymae numerosae, 2 4 florae, breviter pedunculatae, e nodis lateraliter ortae, floribus succedaneis; pedunculus 4 10 mm. longus; pedicelli 3-4 mm. longi; bracteae minutae, triangulares, vix 1 mm. longae. basin lobatus; lobi anguste lineari-lanceolati, 2 2.5 mm. longi, glabri. Corolla erecta, 2.2 2.5 cm. longa; tubus 1.6 1.9 cm. longus, basi 5.7 mm. ovoideo-infratus, circiter 3.5 mm. diam., deinde 10 11 mm. cylindricus, 1.1 mm. diam., fauce vix ampliatus, extra glaber pallide viride-purpureus, intus basi tuberculatus, supra levis et parce pilosus; lobi 5 6 mm. longi, subspathulati, apice connati, basin versus leviter replicati, apice abrupte ampliati, margine pilis fuscis ornati. Corona exterior cupuliformis, circiter 1.5 mm. alta, lobis 5 latissime triangularibus 0.5 mm. longis basi 1 mm. latis apice subacutis vel emarginatis glabris columna staminum longioribus; lobi coronae interioris circiter 2 mm. longi, erecti, vel apicem versus leviter recurvo-patuli, spathulati, leviter compressi, glabri, columnam staminum multo superantes. Folliculi non visa.

Transvaal.—Naboomspruit district, April, *Montgomery* s.n. (flower); Naboomspruit district, April, *Phillips* s.n. (flower); 3 miles south of Nylstroom on road to Warmbaths, Jan., and flowered in Pretoria, Aug., *Eric Codd* 47 (type): 22 miles northeast of Nylstroom on road to Naboomspruit, Jan., and flowered in Pretoria, Aug., *Eric Codd* 53 (flower).

PLATE 1

Ceropegia decidua was first discovered in April, 1947, by Mr. J. A. L. Montgomery, a keen collector of Ceropegia, who thought the plant might prove to be an undescribed species. The following year Mr. E. A. Phillips collected more material and a year later still further material was added by Eric Codd. All these plants were gathered in the Nylstroom Naboomspruit area, though Mr. Phillips has since discovered the species 17 miles N.E. of Pretoria and three miles W. of Hammanskraal on the road to Zoutpan. The plant grows in open bush country in sandy soil, under the shade of trees, very often species of Acacia. An unusual characteristic of the species is that the slightly fleshy leaves are shed in early winter (May-June) before the flowers emerge, hence the specific epithet decidua. Mr. Phillips has made some observations on this point and states that the flowers appear occasionally in winter (July) but August seems to be its flowering period, going on till about October, the leaves appearing after August. Some of the specimens he has found have been erect and branching from the base, though he has also found twining specimens. It is possible that if no support is available the plant adapts itself to an erect habit. The inconspicuous grey-green flowers, unlike most other species of Ceropegia, are more prolific at the base of the stem, where they form small erect clusters, opening successively from ground level along the whole length of the stem.

In the shape of the corolla *C. decidua* is most closely allied to *C. caffrorum* Schltr., though the basal inflation in *C. decidua* is more ellipsoid and minutely tuberculate within, and the flowers are grey-green in colour not dark red-brown, as described by

Medley Wood in C. caffrorum. Other points of difference are the deciduous leaves and the deeper cup-like outer-corona, which far overtops the staminal column.

It is interesting to note that the enlarged apical portion of the corolla-lobe in *C. decidua* varies in shape, in some cases being transversely elliptic, the five apices forming a small canopy, whereas in other cases it is longer than broad, not, or scarcely forming, a canopy.

BURSERACEAE.

Commiphora neglecta *Verdoorn*, sp. nov. (Burseraceae); inter species austro-africana trifoliolatas et spinescentes distincta, a *C. calcicola* Engl. foliis glabris majoribus a *C. betschuanica* drupis globosis haud acuminatis recedit.

Arbuscula vel arbor 8 m. alta nonnunquam suffrutescens. Caules virides vel grisei, squamis membranaceis solubili. Ramuli divaricati, extimi spinescentes, novelli cinereo-pubescentes. Folia viridia, trifoliolata; petiolus sparse pilosus, 0·5-4·5 cm. longus; foliola glabra, minute crenato-serrata (nonnunquam indistincte); medium late obovatum, 1-6 cm. longum et 0·7-3·5 cm. latum, apici breve acuminatum vel rotundatum, basi cuneatum, lateralia orbiculare-elliptica, 0·9-4 cm. longa, 0·5-2·5 cm. lata, apice basique breve acuminata. Flores unisexuales vel hermaphroditi, pedicellati, subfasciculati ramulis valde abbreviatis orti, hermaphroditi et feminei singulares, masculi in cymos dichasia evoluti. Calycis tubus 1 mm. longus lobi 4, 1 mm. longi. Petala 4, libera, plus minus 3·5 mm. longa, 1·5 mm. lata. Stamina 8, 4 plus minus 3 mm. longa, 4 plus minus 1·5-2 mm. longa. Ovarium ovoideum, in stylum crassum acuminatum; stigma globosa. Drupa laevis, rubrescens, subglobosa vel leviter compressa, 1 cm. diam., minute apiculata, pericarpio bivalvi; pyrena laevis, nigra, minute apiculata.

Transvaal.—Waterberg, 21 miles N. of Nylstroom, Codd 4821, Verdoorn 2362; 3 miles N. of Nylstroom, Smuts and Gillett 3340; 10 miles N. of Ellisras Codd 1013; east of Oslo, Codd 4429, 3995, 4430; Kruger National Park, near Punda Maria, Lang in Transvaal Museum Herbarium 31083; 15 miles E. of Skukuza Codd and Verdoorn 5498 (Type fruiting specimen); Codd 4396; Codd and de Winter 5052; 9 miles SE. of Pretorius Kop, Codd and de Winter 5166.

MOZAMBIQUE.—Hornby 2836, Polana Beach, Gerstner 6658.

NATAL.—Gerstner 5025; False Bay, Hlabisa, Gerstner 6767; Mahlabatini, Gerstner 2222; Melmoth, Acocks 13004; Hluhluwe, Mangusi Forest, Forestry Herb. No. 5299; near Umgeni Dam, Bayer 729 and 730.

PLATE 2.

Small tree, sometimes up to 25 ft. tall, occasionally shrubby. Stem green (in some localities green at base only, grey above) bark peeling in thin membranous flakes. Branches divaricate the ultimate abbreviated and spine-tipped, at first ashy pubescent. Leaves spinach green, trifoliolate, varying in size; petiole sparsely pilose 0.5-4.5 cm. long; leaflets glabrous or with a few scattered hairs obscurely to distinctly, but finely, crenate-serrate on the margins, lateral veins about 4; the terminal leaflets broadly obovate, shortly apiculate or rounded at the apex, cuneate at the base, 1-6 cm. long and 0.7-3.5 cm. broad, the lateral sub-orbicular elliptic shortly acuminate at base and apex, 0.9-4 cm. long and 0.5-2.5 cm. broad. Flowers unisexual or hermaphrodite pedicelled and sub-fascicled on abbreviated shoots, the hermaphrodite and female singly and the male in stalked dichasial cymes. Calyx tube 1 mm. long, lobes 4, 1 mm. long. Petals 4, free about 3.5 mm. long, 1.5 mm. broad. Stamens 8, four about 3 mm. long and four about 1.5-2 mm. long (in female flowers aborted). Ovary ovoid narrowing into a short thick style and globose stigma (in male flowers aborted). Drupe smooth, green, turning scarlet when ripe, sub-globose or slightly compressed, about 1 cm. diam. minutely apiculate, 2-valved (and easily breaking into the two segments when ripe), seed smooth black with a minute white apicule, aril scarlet (bleaching with age), with 4 subterete claws running from the base to two-thirds up the seed.

The species described here differs in the particular combination of characters rather than in any outstanding characteristics. This may account for its not having been described before, in spite of its wide distribution in well-collected areas. In all the material seen so far the leaves are constantly trifoliolate and the branchlets spinescent. In these respects, among the South African species, it agrees with *C. calciicola* and *C. betschuanica* and can be distinguished as follows:—

Leaflets pubescent; small shrubs

C. calciicola.

Leaflets glabrous or rarely sparsely pubescent; trees sometimes shrubs:

Leaflets deeply crenate-serrate; drupes ovoid, acuminate

C. betschuanica.

Leaflets not deeply crenate serrate usually obscurely so; drupes globose

C. neglecta.

From the description of *C. rehmanni* Engl. it differs in that the leaves are always trifoliolate and not "trifoliolate and pinnately 5 foliolate on the same branch." Also the leaflets of our plant cannot be described as having the petiole and nerves of the leaflets grey pilose. The description does not mention whether the branchlets are spinescent or not.

The type of *C. rehmanni* which should be in the Berlin-Dahlem Herbarium was collected at "Klippan, Boschveld Transvaal." To date the locality has not been exactly established, and no specimen found that corresponds with the description.

CHENOPODIACEAE.

Salsola humifusa *Brueckner*, sp. nov. (Chenopodiaceae); ab omnibus speciebus habitu humifuso, ramis lateralibus longis gracilibus prostratis stoloniferis differt.

Suffrutex parvus, humifusus, 15-40 cm. diam., praerosus, ramis lateralibus longis gracilibus prostratis stoloniferis. Rami seniores glabri, ramulis et pullulis erectis pilosis. Folia bractiformia, griseo-viridia, opposita, carnosa, ovata, parva, c. 1·5 mm. longa, glabra vel parce pubescentia, supra concava, apice carnosa, marginibus hyalinis ciliatis, base auriculato amplexicaule breve calcarato. Flores axillares, sessiles, 2-bracteolati; bracteolae late ovatae, saepe inaequilateres, c. 1·8 mm. longae, 1·5 mm. latae, carnosae, leviter canaliculatae, marginibus late hyalinis ciliatis. Sepala 5, lanceolata, c. 3 mm. longa, 1 mm. lata, membranacea, ciliata, basi leviter carnosa, in fructu base indurantia gibbosa, pilosa. Stamina 5, filamentis planis; antherae apice attenuatae. Ovarium globosum, apicem versus in stylum bifidum attenuatum; discus patelliformis, 5-lobulatus.

CAPE PROVINCE.—Phillipstown Division: Henrici 3927, Brueckner 683, Kimberley Division: Acocks and Hafström 1282.

O.F.S.—Fauresmith Division: near Koffiefontein, Rabie 15a, C. A. Smith 4514 (type in National Herbarium); near Petrusburg, Rabie 14a..

Fig. 1 and 2.

A procumbent shrublet forming mats from 15 to 40 cm. in diameter, often cropped down, but with long, slender prostrate side branches, rooting at intervals. Older branches glabrous with erect, hoarily-pubescent branchlets and shoots. Leaves bracteolate, greyish-green, opposite, fleshy, ovate, small, about 1.5 mm. long, concave ventrally glabrous or very sparsely pubescent, apex fleshy, margin hyaline and ciliate, base auricled, amplexicaul, shortly spurred. Flowers, sessile, axillary, with two ensheathing bracteoles. Bracteoles opposite, broadly ovate, often asymmetric, about 1.8 mm. long and 1.5 mm. broad, fleshy, slightly keeled, with a wide hyaline, ciliate margin. Sepals 5, lanceolate, about 3 mm. long and 1 mm. wide, membranous but slightly fleshy basally, becoming indurated and lobed basaliy after fertilisation, with loose pubescence marginally and on thickened portions. Stamens 5, filaments flat, anthers attenuated. Ovary globose, narrowing into the style which is bifid at the apex; disc patelliform, 5-lobed.

The prostrate, matted habit of this Salsola is distinctive, and it was isolated as a separate species in 1928 by Mr. C. A. Smith under the unpublished name Salsola humifusa. Growing on the dry margins of pans and vleis, it is often well eaten down by game and small stock, and may be inconspicuous. Characteristic long lateral branches are produced from a long vertical taproot, and root at intervals along their length on



Fig. 1.—Salsola humifusa Brueckner, Photo of type sheet, Smith 4514,

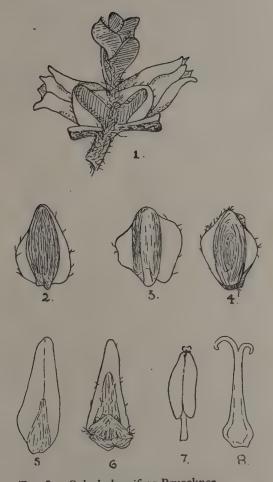


Fig. 2.—Salsola humifusa Brueckner.

1—Tip of branchlet showing opposite flowers. 2—Bract. 3—Bracteole (dorsal view). 4—Bracteole (ventral view). 5—Sepal. 6—Sepal of fruiting perianth (dorsal view), showing thickened indurated basal portion. 7—Stamen. 8—Gynoecium.

the soil surface or underground. The small greyish-green leaves are opposite and decussate, or subopposite, on short erect branchlets. Small flowers are axillary, the comparatively long sepals being conspicuous beyond the fleshy bracteoles which envelope the base. The indurated basal lobes of the fruiting perianth would appear to be homologous with the wings of the fruiting perianth of other Salsola species.

The vernacular names of this plant are Springbokganna and Kruipganna.

Salsola rabieana Verdoorn, sp. nov. (Chenopodiaceae); affinis S. glabrescenti et S. tuberculatae sed ab illa plantibus humilioribus induratioribusque bracteis bracteolisque appresse sericeis sepalis plus minus pubescentibus, ab hac plantis altis non compactis bracteis bracteolisque haud in nodulis compressis differt.

Suffrutex calciphilus, circa 50 cm. altus; ramuli intricati, lignosi, rigidi, indurati. Folia bractiformia, alterna, carnosa, 2 mm. longa, 1·5 mm. lata, dorso appresse sericea, apice carnosa, apiculata, marginibus hyalinis. Bracteolae 2 mm. longae, 3 mm. latae, dorso appresse sericeae, apice carnosae, apiculatae, marginibus late hyalinis. Sepala 5, ovata, c. 3 mm. longa, 1-1·5 mm. lata, centro triangulare pubescente viride carnoso, in fructu ala late horizontali scariosa obcuneata circiter 3 mm. longa, 2·5-5 mm. lata infra medium laborum instructa. Stamina 5. Ovarium depresse globosum 1·5 mm. longum 2·5 mm. diam. in stylum bifidum attenuatum; discus patelliformis marginibus hyalinis obscure lobatis.

Orange Free State.—Fauresmith district: near Koffiefontein, W. A. Rabie 17a, Driefontein, Henrici 3885, 3885a (type), 3887, 3579, 3884, Kies 289; Luckhoff, Farm Rosemarie, Henrici 3826, 3889, 3889a, 3990b; Roodepoortjie, Henrici 3049; Kalabasdrift, Henrici 2865; east of Jagersfontein, C. A. Smith 4388; Jacobsdal, H. G. Schweickerdt 1129; Bloemfontein district: Henrici 2738, 2740.

CAPE PROVINCE.—Hopetown division: Potfontein, C. A. Smith 2815; Herbert division, 10 miles west of Belmont straight along road to Douglas, H. G. Schweickerdt 1129, Clievedon, Brueckner 657. Kimberley division: Kamfersdam, Brueckner 93, 64. Hay division: Heuningkrantz, O. L. Cooke in McGregor Museum, no number, Paauwfontein, O. L. Cooke, no number.

TRANSVAAL.—Ventersdorp district: Raatsiehay, I. B. Pole Evans 3132.

FIG. 3.

Subshrub about 50 cm. high found in lime soils; branches intricate woody, rigid, and hard. Leaves bractlike, alternate, fleshy, 2 mm. long and 1.5 mm. wide, dorsally appressedly sericeus, apex with a fleshy apicule, margins with a hyaline border. Flowers sessile axillary bi-bracteolate; bracts very like the leaves but wider and with wider winglike margins, about 2 mm. long and 3 mm. wide. Sepals 5, ovate, about 3 mm. long, three about 1.5 mm. wide and two about 1 mm. wide, with central, triangular, green, pubescent, fleshy areas which in fruit bear below the middle, horizontal, scarious obcuneate wings about 3 mm. long, of which three are 5 mm. wide and two 2.5 mm. wide. Stamens 5. Ovary depressed globose 1.5 mm. long, 2.5 mm. diam. narrowing above into a bifid style; disc patelliform with a hyaline border which is obscurely lobed.

This species, which is reported to grow on limestone formation, is close to S. glabrescens and S. tuberculata and seems to fall between these two species. From S. glabrescens it is distinguished by being a smaller bush with shorter and more intricate branches and in its greyish appearance due to the bracts and bracteoles being appressedly grey sericeus. S. tuberculata, while resembling our species in the plants being greyish owing to a similar pubescence, differs in being a lower and more compact bush with the bracts and bracteoles congested into nodules "like small brussels sprout" as described by Mr. C. A. Smith.

Many years ago Mr. Smith recognised this as a distinct species and gave it the manuscript name of *S. rabieana* in honour of the late Mr. Rabie of Fauresmith, who had a good knowledge of the veld plants in that area and their vernacular names. The common names by which this species is known are "bloupanganna" and "hardeganna."

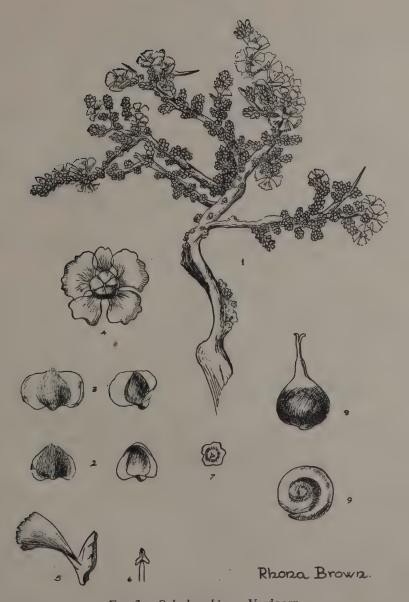


Fig. 3.—Salsola rabieana Verdoorn.

1—Branch of type specimen. 2—Bracteal leaf, dorsal and front view \times 5.

3—Bracteole dorsal and front view \times 5. 4—Mature flower viewed from above, showing the dorsal wings on the sepals \times 3. 5—Sepal and dorsal wing side view \times 6.

6—Stamen \times 5. 7—Disc \times 5. 8—Ovary, style and stigma \times 12. 9—Spiral embryo \times 15.

COMPOSITAE.

Pegolettia retrofracta (Thb.) P. Kies, comb. nov. (Compositae).

Eupatorium retrofractum Thb. Fl. Cap. (1823).

Pegolettia polygalaefolia Less. Syn. Comp. 200 (1832).

Vernonia polygalaefolia Licht. ex. Less. Syn. Comp. 200 (1832), non Less. 1831.

Iphiona polygalifolia Benth. and Hook. Gen. II (1863)...

CYCADACEAE.

Encephalartos humilis Verdoorn sp. nov., affinis E. lanato Stapf & Burtt Davy et E. laevifolio Stapf & Burtt Davy sed ab ambitu inter alia plantis minoribus differt.

Planta humilis. Caudex in toto circa 35 cm. longus, 13 cm. diam., c. 12 cm. epigeus, lanuginosus, soboliferus. Folia recurvata, arcte lanuginosa, glabrescentia, 30-55 cm. longa; pinnae anguste lineares, integrae, apice pungentes, mediae 9-13 cm. longae, 4-6 mm. latae, plus minus 9-nervatae. Strobilus masculinus usque 15 cm. longus et 4 cm. diam.; squamae mediae 1·5 cm. longae et 2 cm. latae, facies dense lanuginosae. Strobilus femineus ignotus.

TRANSVAAL.—Schagen Hill, *Dyer* 4806 (with male cone) type, Verdoorn 2349 and 2350, *Liebenberg* 335; Schoeman's Kloof J. C. Smuts 285; Krantz Nurseries, *Christian* 568 (with male cone); *Verdoorn* 2348; Rosehaugh, *Reynolds* 3936 (with male cone), *Mogg* 17363; Majuba in Berlin Forest Reserve, *Verdoorn* 2351.

PLATE 3.

A low plant more or less hidden in the grass, suckering freely to form small clumps, usually wedged among low rocks. Stem rising about 12 cm. above ground, in the wild state (often higher in cultivation, one observed to be 45 cm. tall), in all about 35 cm. long (30–50 cm. long), 13 cm. diam., usually narrowing to a cone-like apex, thinly lanate. Leaves recurved with leaflets forming a V, glabrescent with small patches of wool persisting, 30–35 cm. long; pinnae narrowly linear, entire, with a pungent apicule; the median 9–13 cm. long and 4–6 mm. wide, more or less 9-nerved, nerves prominent beneath. Male cone up to 15 cm. long and 4 cm. diam., median scales about 1-5 cm. long and 2 cm. wide; scale faces densely lanate and not very prominent. Female cone not seen.

The specimens quoted under *E. lanatus* Stapf and Burtt Davy in the Flora Capensis all have entire, narrowly linear leaflets and come from the Transvaal. Under this species the monographers of the genus, Hutchinson and Rattray, sank *E. laevifolius* Stapf and Burtt Davy. Recent field observations have shown that not only are these two species distinct but that a third and undescribed species is involved. Although closely related, they are nevertheless as distinct from each other, as are some of the species in other groups of the genus.

Field observations on the three species are summarized as follows:

E. lanatus Stapf and Burtt-Davy. The type comes from Toevlugt (the Native name of which is Botshabelo), Middelburg district, Transvaal, and a large number of plants were examined there. They were found on the average to have stems about $1\frac{1}{2}$ to 4 ft. tall (rarely up to 5 ft. tall); to have the leaves retain the lanate covering on the rhachis for quite a long time and the cones, male and female, to be thickly and persistently lanate. The same species was seen on the Wilge River and on General Sir Pierre van Ryneveld's farm 50 miles east of Pretoria. All these places are in what is termed the highveld of the Transvaal.

E. laevifolius Stapf and Burtt-Davy. This species occurs on some of the rocky ridges of the high mountainous country around Barberton (which is in the lowveld). The plants are usually taller than E. lanatus with stems 5 ft. to 11 ft. tall, and the leaves longer; they are soon glabrescent and have a slight glaucous look and the cones, especially the female, become glaucous glabrous except for a small, short lanate spot in the depressed centre of the scale face.

E. humilis n.sp. This newly described species occurs on some of the grass-covered rocky hills below the mountain summits in the lowveld area. It is a small plant, often practically hidden by grass, and the stem rises only a few inches above the ground. In this respect it differs from both the preceding. Another difference is in the male cone. Three male cones each from a plant in a different locality, were seen and they were very much smaller than those of either of the other species, being only up to 15 cm. long and 2 cm. diam. as against about 24-30 cm. long and 4-7 cm. diam. The scale faces in our species are flatter than in either of the others and are a little less thickly lanate than those of E. lanatus and much more so than in those of E. laevifolius.

In connection with the size of the cones it should be noted that since the description of *E. lanatus* in the Flora Capensis is based on specimens of all three species, the measurements given for the cones should not be taken as being those of typical *E. lanatus*. They are in fact smaller than those of either *E. lanatus* or *E. laevifolius* as observed in the field. This is accounted for in one instance by the presence on a herbarium sheet of an immature female cone of true *E. lanatus*, and for the rest the measurements of the male cones were probably taken from specimens of *E. humilis*. For instance the quoted specimen *Wilms* 1355, from "Crococile River near Piet Schoeman" (Flora Transvaal, Vol. 1, p. 99, and Fl. Cap., Vol. 5, 2, p. 43) must be *E. humilis* according to the locality and in the Flora of the Transvaal the specimens mentioned in the following quoted note under *E. laevifolius* are most probably all *E. humilis*: "Davy 32d, collected on the lower slopes of Spitzkop, Lydenburg, 4,000 ft. alt., on the side near Sibthorpe's (several in a clump, all young, among grass by the roadside), and a plant collected by Sim at Rosehaugh, Lydenburg, may belong here."

The late Mr. H. Basil Christian was the first to suspect that there was a third species in this group. Among his very good collection of living cycads were some plants which he had got from the Kranz Nurseries in Schoeman's Kloof (plants said to have come from the neighbourhood) and he noted that the stems were more cone-shaped and the leaf scars smaller than any of his other species. The leaves, though resembling those of *E. lanatus* remained smaller over the long period that these plants were observed growing next to plants of *E. lanatus* and *E. laevifolius*. In connection with the leaves he also observed that they did not arise "like a bunch of asparagus" in the centre of the stem apex but appeared in close succession and the petiole was much twisted. This may be a pathological condition, but it has been noticed since on several plants of this species. Then a male cone appeared and it was like a miniature of the other two species. These observations led to the investigations which resulted in the description of this species.

EUPHORBIACEAE.

Euphorbia clivicola R. A. Dyer, sp. nov. (Euphorbiaceae); affinis E. schinzii Pax ramis brevioribus congestis flavo-viridibus aculeis minoribus differt.

Planta succulenta, perennis, armata. Radix tuberosa caudice continuata, plus minusve 15 cm. longa et 2-3 cm. crassa, attenuata, radicibus tenuibus paucis instructa. Rami plurimi, congesti, breves vel brevissimi, 2-6 cm. longi, 1·5 cm. crassi, indistincte 4-angulati, tuberculati apicem versus angustiores, angulis tuberculis prominentibus, podariis corneis haud confluentibus 2-aculeatis. Aculei circiter 5 cm. longi. Cyma solitaria tribus cyatheis sessilis vel perbreviter pedunculata. Cyathium primum masculinum; 2 bisexualia, lateralia, subsessilia. Involucrum 3·5 mm. diam., glabrum, lobis 5 parvis fimbriatis et 5 glandulis transverse oblongis integris 1·5 mm. latis contiguis flavis munitum. Ovarium glabrum, sessile; styli 2 mm. longi, fere infra medium connati, apice bifidi.

TRANSVAAL.—Potgietersrust district: about 20 miles north of Potgietersrust on Farm Lunsklip, quartzite ridge, *Plowes* in National Herbarium, Pretoria, No. 28386 (type), with photographs. Pietersburg district: near Pietersburg, Kirsten, photographs.

Dwarf spiny perennial succulent with the main stem and root merging into each other and forming an underground tuberous body about 15 cm, long and 2-3 cm, thick, tapering to the base and with a few slender secondary roots. Stem repeatedly branched and retracting further underground as plant enlarges, only the young ultimate branches appearing above ground. Branches yellowish-green, congested into a dense mass, about 2-3 cm. long but up to 6 cm. if the plant is shaded by grass, 1.5 cm. thick towards base, narrower towards apex, being reduced at each successive tubercle, obscurely 4-angled by the more or less decussate arrangement of the tubercles and their paired spines; angles often with spine-pairs opposite but occasionally irregularly disposed, usually armed with spines on the apical 2-4 tubercles; tubercles with the upper margin truncate, sloping gradually below the spines; spine-shields extending to the leaf scar above the spines and 1-2.5 mm. decurrent; spines up to above 5 mm. long, in pairs at the apex of the tubercles, grey, and with minute prickles by the side of the leafscar. Leaves rudimentary, soon deciduous. Inflorescence: cymes solitary from the apical flowering eyes of the branchlets, sessile, usually consisting of 3 cyathia, the central one male with two bisexual cyathia laterally disposed on very short peduncles or sessile; involucre cup-shaped, 3.5 mm. in diam., glabrous, with 5 glands and 5 subquadrate fringed lobes; glands bright yellow, transversely oblong, 1.5 mm. in their greater diameter, entire. Ovary sessile, included in involucre, glabrous; styles about 2 mm. long, united into a column in the basal third, spreading above, with bifid tips.

There seems little doubt that *E. clivicola* is an evolutionary form from *Euphorbia schinzii*-like stock. The present concept of *E. schinzii* is so broad that our plant could be squeezed in also, but this would appear to be making an unsatisfactory position worse. It is felt that some of the many forms now under *E. schinzii* could conveniently be given definite taxonomic status, either with varietal or even specific rank.

The main characters distinguishing E. clivicola from E. schinzii are: the branches

are yellowish-green, broadest below the middle, furnished with few (2-4) spine-pairs, congested into cushion-shaped masses rising only slightly above ground level and

forming a compact plant with a single tuberous main root.

It occurs between Potgietersrust and Pietersburg in the northern Transvaal, on quartzite slopes, in company with Euphorbia clavarioides Boiss., Aloe pretoriensis Pole Evans and Caralluma lutea N.E. Br. The specific epithet refers to the hillslope habitat. Mr. Darrel Plowes, the collector, added that the "soil" was sour, being derived from the white quartzite rubble and consisted mostly of rock chips.

Euphorbia confinalis R. A. Dyer sp. nov., affinis E. triangulari Desf. et E. excelsae W. D. & S., ab illa habitu trunco uno erecto robusto ramis minus constrictis angulis

4 minus compressis, ab hac cymis 1-3, 3-cyatheis differt.

Arbor succulenta usque ad 8 m. alta, trunco cylindrico erecto, ramis numerosis patenti-ascendentibus. Rami usque 1-1·5 m. longi, 2·5-6 cm. crassi, nonnunquam ramosa, 4- vel 3-5-angulati, segmentis 5-20 cm. longis constricti, podariis corneis 2-aculeatis bruneis haud vel rariter confluentibus, aculeis abortivis vel ad 8 mm. longis. Cymae 1-3, plus minusve 2-5 mm. supra aculeos dispositae, 3-cyatheis. Pedunculus 2 mm. longus, ramis 3 mm. longis. Cyatheum primum masculinum; cyathea lateralia 2, bisexualia; involucrum 6-8 mm. diametro, glabrum, lobis parvis obovatis fimbriatis et glandulis 5 transverse elliptico-oblongis circiter 3·5 mm. latis contiguis integris flavis munitum. Ovarium obtuse triangulare, stipitatum; styli 1·5-3 mm. longi infra medium vel medio connati. Capsula plus minusve 8 mm. lata, pedicello circiter 5 mm. rare usque 8 mm. longo exserta.

TRANSVAAL.—Zoutpansberg District: Kruger National Park, 6-7 miles SW. of Punda Maria, Codd 3026; 5366; 10-11 miles SW. of Punda Maria, Dyer, photo; Codd, photo; Pilgrims Rest district, Kruger National Park, 2 miles E. of The Gorge Camp, Codd and de Winter 5580 (type); Barberton district, Komatipoort, Dyer=4799.

PORTUGUESE E. AFRICA.—Near Ressano Garcia, van der Merwe 1698; E. 17; ridges between Moamba and Ressano Garcia, Dyer 4799.

PLATE 5.

Tree 15-25 ft. but occasionally up to 30 ft. tall, with a straight unbranched trunk or occasionally with 1-2 trunk-like branches, with a crown of curved ascending branches which wither with age and fall, leaving the naked trunk. Branches 3-4 ft. long, 4- or occasionally 3-5-angled, constricted at intervals of 5-20 cm. with more or less parallel sides, 2.5-5 cm. between adjacent angles, usually about 3 cm. on flowering segments; angles moderately compressed, about 5 mm. thick near the margin and projecting 3-3.5 cm. from the centre, furnished with paired spines or their rudiments. Spinepairs 1-2 cm. apart, 0.5-8 mm. long, those on young plants conspicuous, becoming obsolete on old trees, on a horny base which is discontinuous or sometimes continuous along the angles. Cymes 1-3 together at the flowering eyes, 2-5 mm. above the spine pairs; each cyme consisting of 3 cyathia, a central male and 2 lateral bisexual cyathia arranged in a plane parallel to the main axis. Peduncle about 2 mm. long, branches 3 mm. long with bracts 2.5 mm. long and as broad, shortly ciliate on the margin, keeled on back. Involucre 6-8 mm. diam. with 5 glands and 5 obovate deeply fimbriate lobes; glands greenish-yellow, transversely somewhat oblong, 3-4 mm. in their greater diam. Ovary 3-angled and raised on a pedicel; and subtended by a small triangular calyx. Styles 1.5-3 mm. long, divided up to or below half-way with bifid tips. Capsule exserted from the involucre on a gynophore about 5 mm. or occasionally up to 8 mm. long.

Information about this plant has accumulated slowly since it was first brought to the notice of the writer in 1936 by Dr. F. Z. van der Merwe. It was referred to in a note under E. triangularis Desf. in the Succulent Euphorbieae 2; 897 (1941). The weight of evidence is now strongly in favour of according it separate specific rank.

In habit it resembles *E. excelsa* W. D. & S. more than *E. triangularis* Desf. but differs in the cymes which in *E. excelsa* are single from the flowering eyes and each has more cyathia. Whereas *E. triangularis* usually has a few to several trunk-like branches, *E. confinalis* more often than not has a straight unbranched trunk crowned by the curved ascending angled branches. The branches of mature trees are often practically spineless and have more solid, or at least less winglike angles and larger involucres than in *E. triangularis*.

E. confinalis occurs commonly on rocky hills on the western border of the Kruger National Park near Punda Maria and extends at intervals southwards on to the Lebombo Mts. and occurs on both sides of the border between the Transvaal and Portuguese East Africa at Komatipoort and Ressano Garcia. This association with boundaries suggested the specific epithet, the choice of which in such a large genus as Euphorbia

being decidedly limited as regards appropriate names.

100

It may be added here that the distribution of *E. triangularis* into Portuguese East Africa seems to be proved by the record of a large colony of fairly typical plants not far from the Swaziland border in the catchment area of the Umbeluzi River on the road to Goba. A specimen collected by Mr. L. C. C. Liebenberg and recorded as rare at the bridge near the Royal Sheba mine near Barberton, and another by Thorncroft, extends the distribution into the Transvaal as well.

Euphorbia keithii R. A. Dyer, sp. nov. (Euphorbiaceae); affinis E. zoutpansbergensi R. A. Dyer, ramis ramosis 3-6-angulatis stylis et ovulis differt.

Frutex vel arbor 2-6 m. alta, succulenta, spinosa, trunco teretiusculo ramis numerosis. Rami plus minusve patenti-ascendentes, ramosi, segmentis usque 25 cm. longis 3-4 cm. crassis constricti, 3-6- plerumque 5-angulati, inter angulos sulcati; anguli compressi, podariis corneis griseis confluentibus aculeis 2, 5-8 mm. longis. Cymae 3, rariter 1-2, supra aculeos emittentae, subsessiles, 3 cyathia; pedunculus bibracteatus. Cyathium primum masculinum deciduum, cyathia bisexualia breviter pedunculata. Involucrum 4-5 mm. diam., glabrum, 5 lobis subquadratis fimbriatis et glandulis transverse oblongis 2-2·5 mm. latis integris contiguis viridi-flavis munitum. Ovarium stipitatum, glabrum; styli 1·5 mm. longi in columnam ad medium versus connati, apice bifidi. Capsula stipite usque 6 mm. longo, 6-7 mm. lata, obtuse trilobata; semina suborbiculata.

SWAZILAND.—On western edge of Ubombo Mts., cultivated, near Stegi, D. R. Keith in Nat. Herb. Pretoria, 28421, 28422, 28423 (type), 28424; about 8 m. SE. of Stegi on east-facing krantz, Dyer, photographs.

PLATES 6, 7 AND 8.

Shrub or small tree 6-20 ft, high with the older branches eventually withering and falling from the stems. Branches dark green, spreading ascending, 1-2 m. long, 3-6usually 5—angled, constricted at intervals into segments; segments varying in length according to habitat conditions up to about 25 cm, long and 3-4 cm, broad with more or less parallel sides or somewhat narrowed to the apex; angles winglike, about 0.7-1.5 cm, deep and 1.5-2 cm, between the ridges of adjacent angles, only slightly tuberculate; spine shields united into a continuous horny margin along the margin of the angles and with the flowering eyes about 5 mm. above the spine pairs; spine pairs 1-1.75 cm. distant, 5 8 mm. long, moderately stout. Leaves rudimentary, about 5 mm. long, ovate-cordate, spreading recurved, soon deciduous. Inflorescence with 3 cymes or occasionally only 1-2 developing from each of the flowering eyes. Cymes subsessile, each cyme consisting of 3 subsessile cyathia vertically disposed, i.e., one central male cyathium and one bisexual cyathium on either side arranged in a plane parallel to the main axis; bracts small, scale-like; involucre cup-shaped, 4-5 mm. in diam., glabrous with 5 glands and 5 subquadrate fimbriate lobes; glands contiguous, yellowish-green, transversely oblong, 2-2.5 mm. in their greatest diam. Ovary exserted on a curved gynophore about 5 mm. long, moderately 3-angled, about 1.5 mm. broad; styles about 1.5 mm. long, united into a column for half their length, with bifid stigmas. Capsule on a curved gynophore about 6 mm. long, reddish-green, obtusely 3-angled, 6-7 mm. broad, flattened, i.e., broader than long, with ovules filling the cells, subglobose, smooth.

Capt. D. R. Keith, of Ravelston, near Stegi, first brought this species to my notice about 1942. He had one young specimen in his garden, from which complete flowering and fruiting material was eventually obtained for description in 1949-50. Efforts to establish the distribution of the species indicate that it does not cover a very wide range. It may well be abundant locally on krantzes on the western side of the Lebombo Mountains, though not necessarily west-facing, since those plants photographed in their

natural habitat in 1947 were mainly on an east-facing aspect.

E. keithii has a general likeness to such arborescent species as E. sekukuniensis R. A. Dyer, but the disposition of the cyathia of the cymes is distinctive. In this essential character it is seen to approach nearest to E. zoutpansbergensis among South African species, but even to that species the relationship is not particularly close. Nearer relatives are likely to be found on the mountains between Southern Rhodesia and Mocambique.

Euphorbia restricta *R. A. Dyer*, sp. nov. (Euphorbiaceae); affinis *E. enormi* N.E. Brramis luteo-viridibus immaculatis podariis corneis confluentibus plerumque 4 6-angulatis differt.

Planta humilis, succulenta, perennis, armata. Radix tuberosa caudice continuata apicem versus 4–8 cm. crassa. Caulis brevissimus, leviter ramosus, tuberculatus. Rami pauci caudicis apice editi plerumque 4–6-angulati, usque 16 cm. longi, 2–3 cm. crassi, maiores segmentis 1–2 cm. longis constricti, podariis corneis confluentibus 2-aculeatis; anguli compressi recti vel rariter leviter torti. Aculei usque 1 cm. longi minimi ad ramorum constrictiones. Cyma singula, subsessilis, tribus cyathiis. Cyathium primum masculinum, 2 bisexualia. Involucrum 5–6·5 mm. diam., glabrum, lobis 5 parvis laceratis et glandulis transverse oblongis 3 mm. latis integris luteis munitum. Ovarium glabrum, sessile; styli 3·5 mm. longi ad medium connati, apice bifidi. Capsula circiter 6 mm. diam., sessilis, obtuse trilobata; semina 2·5 mm. longa, subglobosa, brunea, plana.

TRANSVAAL.—Letaba district: on farm The Downs, between P.O. The Downs and Wandrags Asbestos Mine, 4,500 ft., *Codd* 3092 (type); *Crundall* in National Herbarium, Pretoria, 28391.

A dwarf succulent plant with a combined subtuberous main root and reduced main stem, which usually branches into 2 or more stem-like branches, each of which produces a tuft of aerial flowering branches. Main stem 4-8 cm. diam., irregularly tuberculate with some tubercles over 0.5 mm. prominent. Branches up to about 16 cm. long, generally unbranched, but occasionally rebranched, withering with age and finally falling away from stem, up to about 3 cm. in diam, and constricted into segments 1-2 cm. long, depending on seasonal conditions, 4-6-angled. Angles fairly acute and winglike, armed with a continuous horny margin and paired spines. Spines up to 1 cm. long in pairs at intervals of about 7.5 mm. but closer on stem constrictions, with a pair of prickles on the sides of the flowering eyes, which are slightly below midway between the spine pairs. Cymes solitary from the flowering eyes of the terminal segments, with 3 cyathia, 1 central male and 2 bisexual produced in a plane parallel to the main axis, occasionally 1 bisexual cyatheum suppressed; peduncle very short with 2 broadly ovate obtuse bracts subtending the cyathia; bisexual cyathia with a very short bibracteate peduncle. Involucres cup-shaped, glabrous, 5-6 mm. diam. with 5 glands and 5 subquadrate, somewhat lacerate lobes; glands yellowish, transversely oblong, about 3 mm. in their greater diam., concave, with slightly upturned margins. Ovary sessile, glabrous; styles about 3.5 mm. long united into a column for half their length and bifid at the tips; connective tissue to ovary shortly hood-shaped. Capsule about 6 mm. diam. moderately 3-angled, 2.5 mm. long; subglobose, slightly longer than broad, brown, smooth.

The first record in the National Herbarium of this species dates from April, 1945, when Mr. A. H. Crundall forwarded material from the farm The Downs in the Letaba district of the Northern Transvaal. The plant, however, was not in flower and it was not until Dr. L. E. Codd and Mr. B. de Winter collected complete material on the same farm, in October, 1947, that it was possible to draw up a fuller description. Dr. Codd records that the plants were locally common, growing in shallow soil and in the crevices of dolomite ridges, being associated with E. schinzii Pax. The new species is restricted

both in size and distribution and hence the specific epithet.

While the plant resembles some forms of *E. enormis* N.E. Br. in the Lydenburg district, it is readily distinguished by the branches being unmarked, yellowish-green with up to 6 angles; by the angles having a continuous horny margin; and by the subsessile cymes with smaller cyathia. In general appearance it suggests a miniature *E. barnardii* W. D. & S., which is also in the same geographical region and may well be the closest relative in the evolutionary sense.

Euphorbia unicornis R. A. Dyer, sp. nov. (Euphorbiaceae); affinis E. corniculatae R. A. Dyer podariis corneis 1-aculeatis glandulis connatis facile distinguitur.

Planta humilis, succulenta, perennis, armata, ramosa, usque 30 cm. alta. Rami plus minusve erecti, ramosi, basin versus subcylindrici, 1 cm. crassi, superne indistincte 6-7-angulati, tuberculati; tuberculi pulvinati, 5-7 mm. longi, usque 5 mm. lati, podariis corneis 1-aculeatis. Aculeus singulus, 4-6 mm. longus, 2 superioribus parvissimis 1-1·5 mm. longis. Cyma breviter pedunculata, tribus cyatheis; pedunculi 1·2 mm. longi apice bibracteati. Cyathia apicem ramorum versus producta; primum masculinum; bisexualia 2, lateraliter producta. Involucrum plus minusve 3 mm. diam., glabrum, lobis 5 parvis minute dentatis et glandulis rubris suberectis connatis munitum. Ovarium sessile 3-angulatum; styli 2 mm. longi ad medium connati apice bifidi.

MOCAMBIQUE.—Niassa Province: Quissanga district, Cuero Mt., 400 m. alt., Sept. Pedro and Pedrogao 5091.

PLATE 10.

A branched succulent spinescent shrublet, up to about 30 cm. tall, greyish-green with purplish tinge. *Branches* subcylindric, about 1 cm. thick, not perceptibly constricted at intervals, possibly commonly with two lateral branches arising from the same level, indistinctly 6-7-angled or subcylindric with 6-7 grooves about 1 mm. broad at the base, tubercled along the angles and with rudimentary leaves on young growth.

Tubercles slightly prominent and cushion-like, almost completely covered by a horny surface but with the horny surface interrupted narrowly between the tubercles at the flowering eyes, bearing centrally a single spine 4–6 mm. long and above this 2 prickles 1–1·5 mm. long, one on either side of the leaf-scar. Flowering-eyes 5–7 mm. apart, slightly above the leaf-scars. Cymes solitary from apical flowering-eyes on peduncles 1–2 mm. long, consisting of a central male involucre and 2 lateral bisexual cyathia arising in a plane at right-angles to the main axis. Bracts oblong, 1 mm. long. Involucre cup-shaped, about 3 mm. diam. with 5 subquadrate finely-toothed lobes and a glandular rim. Glands 5, red, apparently forming a continuous rim but actually connected by very narrow membranes. Ovary sessile, 3-angled. Styles 2 mm. long, united for about half their length, the free portions becoming twisted, emarginate at the slightly flattened tips.

The cushion-like tubercles almost completely covered by a horny shield seem to distinguish this and the related species *E. corniculata* from previously described plants. I have, however, seen a similar but incomplete and unnamed specimen with paired spines collected near the Kenya-Somaliland border, and a close comparison of other tropical African dwarf species is indicated. The pattern of the cyme is similar to that

displayed by E. schinzii and its relatives.

I am very grateful to the two Portuguese collectors, Messrs. Pedro and Pedrogao, who kindly forwarded the material with the following additional information: "common name 'nya nyach', growing near the administrative officer's residence on rocky outcrops, greyish-green purpurascently shaded, involucre rosy to red." The connection of the glands by very narrow membranous strips into a continuous cup-shaped structure is most unusual for the genus.

Jatropha messinica E. A. Bruce, sp. nov. (Euphorbiaceae); affinis J. pseudoglanduliferae Pax, sed foliis fere basin lobatis, petalis florum masculinorum liberis, sepalis femineorum lanceolatis, stylis liberis vel basi connatis differt.

Suffrutex parvus, glaber, 60-90 cm. altus; caules plures, erecti, basin versus ramosi, substriati, pallido-cinerei vel stramenei. Folia chartacea, viridia, glabra, digitata, usque basin 5-7 lobata; lobi lanceolati—anguste elliptico-lanceolati, 2·5-6 cm. longi, 5-7 mm. lati, apicem et basin versus angustati, margine glanduloso-serrati, nervis lateralibus utrinque impressis usque media circiter 16, nerva media supra impressa, subtus prominenta; petiolus 2-3.5 cm. longus, glaber. Stipulae dissectae, setaceae, 4-5 mm. longae, glanduliferae. Inflorescentia terminalia in cymis pedunculis disposita; bracteae lanceolatae, acutae, 3-4 mm. longae, margine et apice glandulosa-dentatae. Flores masculini subsessiles, apicem versus 5-6 dispositi, pedunculo circiter 6 mm. longo. Sepala & 5, ovata, acuta, circiter 1.5 mm. longa, basi cohaerentia, glabra, eglandulosa. *Petala* 3 5, libera, glabra, late ovata, circiter 2 mm. longa, 1 5 mm. lata, apice rotundata, basi subunguiculata. *Stamina* 8, monadelpha, antheris vix 1 mm. longis. Flores feminei, basi inflorescentia masculina solitarii, subsessiles vel breviter pedicellati. Sepala \(\precess{2} \) 5, lanceolata, circiter 3 mm. longa, margine integra vel superne glandulosa. Petala 9 5, libera vel leviter coherentia, glabra, obovata, circiter 6 mm. longa, 3 mm. lata, apice rotundata, basin versus angustata, subunguiculata. Discus 5-lobatus. Ovarium ovoideum, glabrum, 3.5 mm. longum, 2.5 mm. diam., leviter trilobatum; styli 3, erecti, liberi vel basi vix connati, persistentes, circiter 2 mm. longi, stigmata crassa bifida tuberculata. Capsula ovoidea, leviter trilobata, 11 mm. longa, 9 mm. lata, rugosa, fusco-cinerea, petalis sepalisque basi persistentibus. Semina suboblonga, c. 7 mm. longa, 4 mm. lata, pallido-brunnea vel straminea fusco-maculata, dorso rotundata aliter compressa, apice carunculata.

TRANSVAAL.—Zoutpansberg district, Messina, a few hundred yards from the railway station west of Messina, May, 1945, Gerstner 5461, flower and fruit, type; Gerstner 5447; Vanetzi Valley, 2,500 ft., March, 1946, Gerstner 6052; Messina, Government Experimental Farm Vergelegen, March, D. G. Steyn; Messina, 1,900 ft., on margins of river bed, June, Galpin 9191; Dongola, Farm Greefswald No. 615, 1 mile north of

Mapungubwe, 1,700 ft., on a rocky sandstone ridge in light shade, April, Codd 4125.

Jatropha messinica is a small half-herbaceous shrub or soft bush with bright green digitate leaves very similar to those of Cannabis sativa. There are six different collectings of this species in the National Herbarium, Pretoria; four from Messina, one from Dongola and one from the Vanetzi Valley about 20 miles south-east of Messina, so the specific epithet messinica was thought to be appropriate. The Dongola specimen, Codd 4125, was sent to Kew for identification and was returned as equal to specimens of Moss and Rogers 76 and Rogers 19350 named J. pseudo-glandulosa. There is no record of such a name being published and this is probably a clerical error for J. pseudo-glandulifera, which the laison officer at Kew says is quite distinct from our specimen.

J. messinica belongs to the section Glandulifera Pax of the subgenus Adenoropium (Pohl) Griseb., which is characterized by the flowers having both petals and sepals and the stipules being fimbriate and persistent. It is most nearly allied to J. pseudo-glandulifera Pax, but differs from this species in the deeply 5-7-lobed leaves, the segments of which are almost free to the base. There are also slight differences in the floral characters, the styles in J. messinica are free almost to the base, whereas in J. pseudo-glandulifera they are connate for two-thirds of their length, the sepals of the female flowers in the former species are lanceolate, whereas in the latter they are ovate. There seems to be some variation in both male and female flowers among the specimens quoted under J. messinica. A male flower of Codd 4125 was examined and was found to be larger than those of the type (Gerstner 5461), the sepals were oblong 2.5 mm. long and the petals 3.5 mm. long and 2.5 mm. broad and just cohaerent at the base, not free as in the type. In the female flowers the petals of the type were coherent at the base, whereas in Codd 4125 they were free. These slight differences are interesting to record, though they are not of specific importance.

LABIATAE.

Coleus vagatus E. A. Bruce, sp. nov. (Labiatae); affinis C. pentheri Gürke, sed habitu prostrato vagato bracteis herbaceis viridibus subcrassis apice plus minusve truncatis numquam acuminatis valde distinctus.

Herba perennis, aromatica, basi ramosa; caulis primus subquadrangularis, laterales prostrati, vagati, subteretes, usque 60 cm. longi, circiter 2.5 mm. diam., pilis albidis multicellulis patulis parce pilosis et pilis brevibus incurvis pubescentes et glandulis aurantiacis parcissime induti, internodiis 2-6 cm. longis saepe e nodis radicati. Folia opposita, petiolata; petiolus 0·5-1 cm. longus, planus, pubescens et pilosus; lamina ambitu diversa, late ovata—obovata, 1·5-2·5 cm. longa, 1·5-2 cm. lata, apice rotundata, superne crenata, inferne in basin cuneatim angustata et integra, pallido-viridis, crassa, subtus plus minusve dense supra paricissime pubescens at glandulis aurantiacis punctata, margine pilis albidis incurvis ciliata; nervi vix conspicui, supra leviter impressi, subtus prominentes. Inflorescentia compacta, sub anthesi circiter 10 cm. longa, verticillastris sessilibus 4-6 floris; bracteae oppositae et decussatae, virides, oblongo-ovatae, 9 mm. longae, 6 mm. latae, subcrassae, apice late rotundatae vel subtruncatae, margine inferne pilosis multicellulis albidis ciliatae, subtus aurantiaco-glandulosae et appresso-pubescentes, supra parce pubescentes nec glandulosae; pedicelli c. 3 mm. longi, pubescentes, suberecti. Calyx bilabiatus, glandulosus et pilosus; tubus brevissimus, c. 1.5 mm. longus; lobus posticus suborbiculatus, 3 mm. longus, 4 mm. latus, apice plus minusve apiculatus margine longe ciliatus; lobi laterales triangulares, c. 2 mm. longi, antici lateralibus similes 1.5 mm. longi uterque ciliati. Corolla c. 1.6 cm. longa, patens, atro-violacea; tubi pars inferior cylindrica, 3-3.5 mm. longa, pars superior geniculatus, ampliatus, compressus, 5 mm. longus, 4 mm. latus, breve pubescens et parce glandulosus; lamium posticum erectum vel leviter recurvatum, suborbiculatum 4 mm. altum, 4.5 mm. latum, parce glandulosum et pilis longis paucis instructum, superne leviter 4-lobatum, lobis posticis majoribus et latioribus 2-2.5 mm. latis, lobis lateralibus minoribus 0.5 mm. latis subacutis; lamium anticum patens, cymbiforme, 1 1.1 cm. longum, c. 3.5 mm. profundum, pubescens, glandulosum, et pilis longis paucis



Fig. 4.—Coleus vagatus E. A. Bruce. 1.—Plant, natural size. 2.—Bract, \times 2. 3.—Calyx split open, \times 2. 5.—Portion of stem with leaves, natural size.

instructum. Stamina 4, declinata, 2 labium anticum subequalia, vel paullum exserta, 2 breviora; filamentis parte superiore excepta in tubum antice apertum connatis; antherae 1·25 mm. longae. Ovarium glabrum, disco in glandulam late oblongam leviter concavam vix 1 mm. longam producto; stylus gracilis, c. 2·2 cm. longus.

Transvaal.—Nelspruit district, Kruger National Park, 1½ miles E. of Skukuza, 900 ft., in lowveld bush, on stream bank, May, Codd 5489 type. Zoutpansberg district, Messina, Dec., Rogers 20708; Komatipoort, April, Dyke, 5516.

SWAZILAND.—On the road to Komatipoort, May, Pole Evans 3461.

Fig. 4.

Coleus vagatus is an inconspicuous, aromatic, perennial herb with a fairly short, erect, quadrangular main stem, from which a number of long, prostrate, straggling branches arise, which frequently root at the nodes. The species is most closely allied to Coleus pentheri Gürke but differs from it in the prostrate habit, fleshy leaves and green, ovate bracts, which are more or less truncate and not acuminate at the apex. The bracts are arranged in densely packed opposite and decussate pairs, each bract subtending a 3-flowered cyme, so that the whole forms a dense spike terminating a lateral branch. The deep violet flowers only appear a few at a time and do not make a conspicuous show, so that the green inbricate bracts are the main feature of the inflorescence. In common with some other species of the genus C. vagatus bears numerous red-gold glands and long white, multicellular, bristle-like hairs, which are particularly prominent on the bracts, though they are also present on the stems, leaves, calyces and corolla and the glands are even present on the anthers. The specific epithet vagatus meaning straggling or wandering refers to the habit of the plant.

LILIACEAE.

Asparagus glaucus Kies, sp. nov. (Liliaceae); A. suaveolenti Burch. affinis sed perianthiis majoribus persistentibus differt.

Suffrutex 30-60 cm. altus. Radices multi, crassi, fusiformes, 0.6 cm. diam. Rhizoma squamis stramineis 2 cm. longis vestita Caules aggregati (juniores exteriores), glauco-purpurei, squamis deltoideis coriaceis amplexicaulibus marginibus membraneceis 0.7 cm. longis ornati, caules seniores straminei, basi simplices, superne ramosi, ramis patentibus; ramuli fasciculati, pungentes, squamis membranaceis parvis ornati. Cladodia 1-6 fasciculata, teretia, mucronata, leviter curvata, glauca, 3-7 mm. longa. Flores solitarii vel binati. Pedunculi basin versus articulati, 3 mm. longi. Perianthium cremeum, segmentis 3 mm. longis patulis dorso purpureo-carinatis. Filamenta lanceolata; antherae luteae. Stylus brevis, brevissime 3-ramosus. Bacca glaucoviridis, 3 mm. diam., globosa, perianthio persistente inclusa. Semina nigra, solitaria.

CAPE PROVINCE.—Kimberley division: Mollers Pan, Acocks and Hafström, H. 874; Riet River, Acocks 8464.

S.W.A.—Great Namaqualand: Great Karas Mountains, Ortendahl 425.

ORANGE FREE STATE.—Fauresmith division: Petrusberg, *Marais* 124; Ventersvlei, *Verdoorn* 1153; Veldreserve, *Henrici* 3987. Heuningberg, *Marais* 155; Groenvlei, *Mogg* 13621, *Kies* 340 (Type in Nat. Herb. Pretoria); Rosemarie, *Verdoorn* 2148, 1623a.

Fig. 5.

Shrublet, 30-60 cm. high. Roots thick, fusiform, 0.6 cm. diam., many; rhizome clothed by straw-coloured striate horny scales, 2 cm. long. Stems many, growing in circular patches (young shoots round the edge of the patch), glaucous, purple or greenish, bearing deltoid amplexicaul squamae of leathery texture and with membranous margins, 0.7 cm. long; older stems becoming straw-coloured, simple at base, branched above with branches stiffly at right angles. Branchlets fascicled, ending in



FIG. 5.—Asparagus glaucus Kies (Kies 340). 1—Twig, \times 1. 2—Twig with fruits, \times 1. 3—Flower, \times 2. 4—Perianth lobe with stamens attached, \times 3. 5—Gynoecium, \times 3. 6—Rootstock, \times 1.

sharp spines, bearing minute membranous squamae which subtend the cladodes. Cladodes 1-6 per fascicle, terete, mucronate, narrowed towards the base, slightly curved, glaucous, 3-7 mm. long. Flowers solitary or sometimes 2-nate. Peduncles jointed near the base, 3 mm. long. Perianth lobes 3 mm. long, patently spreading, creamy with purple line down centre on outside. Filaments broadly lanceolate, anthers yellow. Ovary with style short and style branches very short. Fruit glaucous, green, 3 mm. diam. covered by the dry, horny, keeled, persistent perianth. Seed single, black.

Found on surface limestone with Salsola, and on alluvial soil. Plentiful and characteristically glaucous in appearance. It differs from A. suaveolens principally in the glaucous appearance and the larger perianth which persists and encloses the ripe fruit.

Kniphofia ensifolia Bak. var. albiflora E. A. Bruce, var. nov. (Liliaceae); a typo floribus albidis differt.

Transvaal.—Pretoria district: 13 miles west of Witbank on the road to Pretoria, November 1947, Codd and de Winter 3156 in National Herbarium Pretoria 28928 (type); September, 1948, Codd 4774; 14 miles south-east of Pretoria, December, 1947, Bruce 27; 2 miles east of Middelburg, November, 1949, Codd 5767.

This striking Kniphofia with its narrow spikes of cream or white flowers, long exserted stamens and broad glaucous leaves, was found in a marshy vlei in black clay loam 13 miles west of Witbank. The 3½-5 ft. high plants were growing in small clumps and were locally abundant in an area of about a quarter of an acre. At first this was thought to be an undescribed species closely allied to K. ensifolia Bak., K. tuckii Bak. (Bot. Mag. t. 7644) and K. rivularis Berg. (F.P.S.A. pl. 866). K. ensifolia was originally collected in the Western Transvaal near the Matebe River about 12 miles north-west of Zeerust. K. tuckii is a native of Colesberg in the northern Cape, and K. rivularis was described from Modderfontein, north of Johannesburg. K. rivularis had previously been found in the Rietvlei catchment area near Pretoria, so it was decided to visit this area and make a comparison between these plants and the specimen from Witbank. It was not until December 12th, over a month later, that K. rivularis was found in flower, thinly scattered in a vlei about 14 miles south-east of Pretoria. The flowering spikes of this species consisted of dull red flowers in the upper part and greenish-white below, but one inflorescence was found with pure white flowers and no trace of red. This plant was compared with our var. albiflora from near Witbank and no real distinction could be found. Both were tall plants with broad glaucous-green leaves with serrulate keels and margins, though this latter character was variable and some of the outer leaves were smooth; the peduncles in both cases were slightly longer than the leaves and the inflorescences dense, white-flowered and sub-cylindrical. The only difference observed was that the plant from Rietvlei was in flower a month later and that a basal sterile bract 5-8 cm. long was conspicuous in the bud stage of this plant and was not observed in the Witbank ones. It was now necessary to determine whether K. rivularis, the most recently described of the three species, was distinct from the other two. The type specimens of K. ensifolia Bak., K. rivularis Berg. and K. tuckii Bak. were kindly loaned by the Royal Botanic Gardens, Kew, for comparison. The type of K. ensifolia was unfortunately very fragmentary, but a careful examination of all three specimens was made and though there were minor differences between them in the width and serration of the leaves and the size of the floral bracts, they agreed well in the shape and density of the inflorescence, the shape of the floral bracts, the size and shape of the perianth and the length of exsertion of the stamens. Since going to press both K. ensifolia and K. tuckii have been collected from their type localities and from this material it is clear that K. rivularis is not distinct from K. ensifolia, though K. tuckii differs in its brighter flower colour and shorter leaves and should be upheld only as a variety of K. ensifolia, while our white-flowered plant becomes K. ensifolia Bak., var. albiflora E. A. Bruce.

OCHNACEAE.

Ochna glauca Verdoorn, sp. nov. (Ochnaceae); O. pretoriensi Phillips accedit sed a qua et a ceteris speciebus africanis foliis ramulisque glaucis differt.

Frutex 1·5-2·5 m. altus; ramuli glauci, lenticellati lenticellis haud conspicuis. Folia hysterantha, glauca, late oblongo-elliptica, 3 cm. longa, 1·8 cm. lata, marginibus minute crenato-serratis; petioli 2-5 mm. longi. Flores solitarii, apices ramulorum valde abbreviatorum orti; pedunculi 10-12 mm. longi. Sepala subaequalia, plus minusve oblonga, 7·5-8 mm. longa, 3·5-5·5 mm. lata, persistentia, deinde 1 cm. longa et reflexa. Petala mox decidua, unguiculata, circa 10 mm. longa, 8 mm. lata. Stamina indefinita; filamenta circa 4 mm. longa; antherae 2·5 mm. longae, 0·75 mm. latae, basifixae, rimis apicalibus dehiscentes. Carpella 5, 1 mm. longa, 0·5 mm. lata; stylus gynobasis 5·5 mm. longus apice breviter 5-lobatus; lobi 0·25 mm. longi apice stigmatosi. Drupae nonnumquam 2 disco incrassato insidentes, circa 8 mm. longae, 6 mm. latae.

Transvaal.—Zoutpansberg district: de Klunderdt, Dongola Botanic Reserve, *Pole Evans* 4494 (fruiting) type; 4590; 4588 (flowering); *Verdoorn* 2292, 2333.

A glaucous straggling shrub 5-8 ft, tall; branches brittle, lenticels not very conspicu-Leaves crowded, glaucous, metallic green, hysteranthus, often folded about the midrib and drooping, broadly oblong elliptic, about 3 cm. long and 1.8 cm. broad, margin rather obscurely or finely crenate-serrate, teeth proclivent, midrib prominent beneath, many slender lateral veins prominent above or on both surfaces and reticulate veins fairly obvious; petiole 2.5 mm. long. Flowers precocious, solitary at the apices of much abbreviated shoots which are numerous on the apical branchlets. Peduncle slender 10-12 mm. long. Sepals 5, rather unequal, the outer 7.5 mm. long 5.5 mm. broad, and the inner 8 mm. long and 3.5 mm. broad. Petals soon deciduous, obovate, crinkled in bud, 10 mm. long 8 mm. broad, rounded or bluntly acuminate at the apex, cuneate into a claw at the base. Filaments numerous, about 4 mm. long; anthers 2.5 mm. long, 0.75 mm. broad basifixed, dehiscing by 2 apical slits. Carpels 5, 1 mm. long and 0.5 mm. broad; style gynobasic, 5.5 mm. long, very shortly 5-lobed at the apex, lobes 0.25 mm. long, stigmatic at the apex. Fruit usually with 2 carpels maturing on the fleshy disc, about 8 mm. long, 6 mm. broad, green, turning brownish (persistent sepals reflexed from the disc turning reddish-brown).

All the specimens quoted above come from a granite hill on the farm de Klunderdt in the north-western Transvaal, but they were collected at different times of the year. The farm De Klunderdt was in the now abandoned Dongola Reserve. The species occurred in large numbers on this particular hill but it has, to date, not been recorded from anywhere else in South Africa. A duplicate sent to Kew was matched with a specimen, Eyles Herb. 3765, from the Matopos, S. Rhodesia, so it is probable that the species occurs in the granite hills of that country and our locality is the most southerly one. (While in press it has been possible to confirm this through the courtesy of the officer in charge of the Salisbury Herbarium.)

The glaucous green leaves are the most striking characteristic of this species. Like other species of Ochna the shrubs are leafless in winter and the flowers appear profusely before the leaves in spring. The leaves and fruits are borne during the very hot months when few collectors are out in the granite hills of these sub-tropical regions.

The species, having the inflorescence solitary or 2-nate at the apex of abbreviated shoots, falls in the same section in Phillip's key (Bothalia 1, Part 2, page 87) as O. pretoriensis Phillips and it is nearest to that species. Besides the glaucous colour of the leaves there are other characters in which our specimens differ from O. pretoriensis, but further material is required before they can be said to be specific distinctions. There seems to be some variation in leaf-shape in O. pretoriensis but the leaves of our plant are shorter and broader than those of the type and less distinctly serrate. In the fruiting erial of O. glauca the enlarged persistent sepals are not erect and surrounding the

mat

ripening fruits as seen on specimens of *O. pretoriensis*, but are strongly reflexed, exposing 2 green drupes, turning brownish as they ripen, seated on the enlarged disc, the sepals also turning a brownish-red colour. In *O. pretoriensis* the sepals eventually become reflexed evidently only after the fruit has ripened. The flowers, especially the petals of our specimens, are smaller than those of typical *O. pretoriensis*.

PEDALIACEAE.

Ceratotheca saxicola E. A. Bruce sp. nov. (Pedaliaceae); ab omnibus speceibus foliis minoribus suborbiculatis vel late ovatis, floribus concoloribus hellebori-rubris habitu minore multo ramosa saxicola valde distincta.

Herba perennis, parva, c. 45 cm. alta, basi et superne multo ramosa; rami graciles, teretes, lignosi, dense pubescentes, basi c. 3.5 mm, diam., ramuli graciliores vix 1.5 mm. diam., internodiis 1-2.4 cm. longis. Folia patuli, opposita, longe petiolata; petioli foliorum inferiorum usque 1.5 cm. longi superiorum 3 mm. longi, dense pubescentes; laminae suborbiculares vel late ovatae, inferiores $1 \cdot 3 - 1 \cdot 8$ cm. longae, $1 \cdot 3 - 2 \cdot 4$ cm. latae, basi truncatae, late cuneatae vel rare subcordatae, apice rotundatae, margine crenatae, utrinque pubescentes, superiores minores, ovatae vel late ovatae, 9-11 mm. longae, 8-13 mm. latae, basi cuneatae, aliter quam inferiores. Flores hellebori-rubri, in axillis foliorum superiorum solitarii; pedicelli 4-5 mm. longi, pubescentes. Calyx ad basin 5-lobatus; lobi leviter inaequales, oblongi, inconspicue falcati, 5-5.5 mm. longi, 2-2.5 mm. lati, apice rotundati, utrinque pubescentes. Corollae-tubus c. 2 cm. longus basi subglobosus, 3 mm. longus, 4 mm. diam., deinde inflatus oblique subcampanulatus, fauce 1.5 cm. diam., extra pubescens, intus e constrictione dense pilosus aliter glaber; lobi 5, extra pubescentes, intus glabri, 1 inferiore majore subpendulo late ovato 7 mm. longo 8.5 mm. lato, 4 superioribus suberectis transverse ellipticis 3 mm. longis 6.5 mm. latis. Stamina 4, subdidynama, supra constrictionem inserta, filamentis 1·1, et 1·2 mm. longis glabris, antheris anguste oblongis 3 mm. longis. Discum annulum, c. 0.5 mm. profundum. Ovarium subcylindricum, c. 2 mm. longum, 1.3 mm. latum, apice rotundatum, pubescens; stylus gracilis, glaber, 1.8 cm. longus, stigmata bilobata lobis planis oblongis apice acutis usque 1.5 mm. longis. Capsula oblongoovoidea, compressa, pubescens, 8-9 mm. longa, c. 5 mm. diam., apice breviter bi-cornuta, basi rotundata, cornubus patentibus vix 0.7 mm. longis. Semina subovoidea, compressa, brunnea, c. 2 mm. longa, rugoso-tuberculata, margine pallidiore leve.

TRANSVAAL.—Zoutpansberg district: Kruger National Park, 32 miles north-east of Punda Maria, 1,000 ft., in crevices in sandstone krantzes overlooking the Levubu River, May, Codd 5535 (type); April, Codd, 5980.

Ceratotheca saxicola is an attractive little plant with showy deep hellebore red flowers (Ridgway, pl. 38), differing from other species of Ceratotheca in its branched, bushy habit and small leaves. It appears to be very localized, as Dr. L. E. Codd, who discovered the species, has found it growing in only the one place in the Kruger National Park, though he has done extensive survey work on the flora of the whole of that region. Only two or three plants were found growing in a more or less inaccessible rock crevice on a steep rock face in Karoo sandstone formation, on the south bank of the Levubu River some miles west of the Pafuri Rest Camp.

C. triloba E. Mey ex Bernh., the only other species recorded from South Africa, is a common weed, which occurs throughout both Tropical and South Africa. Our plant is easily distinguished from this, not only in the flower colour, habit and size of leaves but also in the oblong obtuse calyx lobes, the broader anthers and stigma lobes, the very short horns on the capsule and the lack of glandular pubescence.

The specific epithet saxicola, meaning "rock-dweller" refers to the plant habitat.

RUTACEAE.

Fagara humilis E. A. Bruce, sp. nov. (Rutaceae); affinis F. capensi Thunb. et F. magalismontanae Engl., a quibus foliolis minoribus latioribus numquam nitidis basi rotundatis paribus subaequalibus nec apicem versus majoribus, rhachide piloso nec vel vix caniculato, floribus majoribus valde distincta.

Frutex parvus, 0.9-1.5 m. altus, cortice pallido-cinereo; rami e basi plures, suberecti, ramosi, dense pubescenti, demum glabrescentes, 4-7 mm. diam., aculeis plerumque curvatis 5-9 mm. longis basi valde dilatatis interdum e ramulis junioribus aculeis suberectis armatis. Folia petiolata, 8-15 (plerumque 9-10) jugata paribus subaequalibus vel apicem versus minoribus; petioli et rhachides 7-9 cm. longi (juniores breviores 3-6 cm. longi,) pilosi nec vel vix caniculati, aculeis parvis recurvatis armati. Foliola aromatica, sessilia, coriacea, numquam nitida, ovata vel oblongo-ovata, leviter obliqua, basi rotundata, apice rotundata vel rare subacuta, 1-1·3 cm. longa, 5-7 mm. lata, margine superne crenata in quoque sinu glandula notata leviter incurvata pilis paucis ciliata, nervis lateralibus utrinsecus circiter 4-6 patulis; foliola juniora tenuiora, minora, supra fusca subtus pallidiora. A Inflorescentia racemosa, racemis e nodo caulis apicem versus 4-7 fasiculatis; racemi 2·5-3 cm. longi, 4-6-flori, pedunculo pubescente basi sublanato petiolo multo breviore; flores albi vel flavi, breviter (1-1.5 mm.) pedicellati, inferiores mox decidui, pedicellis basi articulatis. Sepala 5, parva, late triangularia, basi connata, c. 1 mm. longa, apice plus minusve lanata, acuta. Petala 5, oblongoelliptica, leviter cymbiformia, c. 4.5 mm. longa, 1.8 mm. lata, basi angustata, apice obtusa vel subacuta. Stamina 5, filamentis 2 5 mm. longis, antheris anguste oblongis 2 mm. longis. Ovarium abortivum, parvum, subglobosum.

[Inflorescentia spicata, spicis apice caule 3-5 fasciculatis; spicae c. 2 cm. longae, pedunculo pubescente. Sepala 5, parva, ovato-triangularia, basi connata, c. 0.5 mm. longa, apice obtusa vel subacuta, margine ciliata. Petala 5, oblongo-elliptica, 2·5-3 mm. longa. Stamina 0; staminodia minuta. Ovarium late et oblique ovoideum, 1.5 mm. longum, stylo incurvato unilateraliter juxto, stigmata subglobosa, disco parvo. Capsula oblique ovoidea, circiter 7 mm. longa, glandulosa, brunnea. Semina solitaria, nigra nitidaque.

Transvaal.—Letaba district: Kruger National Park, 4½ miles south of Shingwedzi Camp, 1,000 ft., shrub 4 ft. high with yellow flowers and reddish twigs, in Mopane veld on reddish granitic flats, Nov. 4th, 1948, Codd and Dyer 4671 (3 fls.) type; Shingwedzi Camp, near Ranger's house, 900 ft., shrub 3 ft., erect branches, aromatic leaves and white flowers, in lowveld bush on rocky koppie, Nov. 3rd, 1948, Codd and Dyer 4651 (3 fls.); Lamont 25 (young fruit); 13 miles north-east of Punda Maria, 1,400 ft., shrub 5 ft. high with aromatic leaves in Mopane veld in leegte, Codd and Dyer 4579; near Skukuza, in bush, leaves sweet-scented, Oct. 1934, Letty 68 (\$\frac{1}{2}\$ fls.). Vanetzi River, 2,500 ft., shrub 4 ft. in dry bush veld, root-bark used against sores in the mouth, oil cellules in corners of leaf serrations, March 2nd, 1946, Gerstner 6034 (leaf); near junction of Limpopo and Pafuri Rivers, Smuts 2392 (leaf).

Portuguese East Africa.—On dry stony soil in forest of Copaifera and Acacia, May 8th, 1944, *Torre* 6599 (fruit).

This interesting species of Fagara has been collected several times in the Kruger National Park in addition to two outside localities. Material of both male and female flowers, fruits and leaves has been gathered, so that it has been possible to draw up a full description of the species. According to Engler's revision of Rutaceae in Engl. and Prantl. Natürliche Pflanzenfamilien Bd. 19A, p. 221 (1931), this species should belong to Section Maqueria Triana and Planch., subsection Paniculatae Engl. § Gerontogaeae Engl., and in the small leaflets is most closely allied to F. capensis Thunb. and F. magalismontana Engl. It is, however, distinguished from these species in the dwarfer habit, pubescent branches and leaf rhachis, dull surfaced leaves and fasciculate inflorescences.

F. humilis, as the name implies, is a small, comparatively insignificant shrub with no outstanding characteristics. It grows singly or forms a low thicket of thorny stems, which bear the small creamy-yellow flowers towards the ends of the branches in late spring before the leaves are fully developed.

SCROPHULARIACEAE.

Lindernia dongolensis E. A. Bruce, sp. nov. (Scrophulariaceae); affinis L. stuhlmanii Engl., sed caule simplice, foliis inferioribus plurimis, superioribus apicem caulis versus longioribus, floribus axillaribus differt.

Herba erecta, simplex, gracilis, glabra, 5-7 cm. alta, caule subqudrangulare circiter 0.5 mm. diam. Folia sessilia, integra, glabra, inferiora plurima, linearia vel subulata, 5-7 mm. longa, basi 1 mm. lata, superiora linearia vel anguste lineari-lanceolata, usque 1.3 cm. longa, 1.5 mm. lata, apicem caulis versus in 2-4 paribus disposita. Flores in axillis foliarum superiorum solitarii, pedicellis 4-8 mm. longis. Calyx campanulatus, glaber, 2-2.5 mm. longus, 5-lobatus, lobis trianglari-ovatis circiter 1 mm. longis basi vix 1 mm. latis apice rotundatis vel subacutis minute mucronatis. Corolla 9-11 mm. longa, tubo infundibuliformi 4-5 mm. longo fauce circiter 4 mm. diam., labio superiore anguste obovato glabro 4 mm. longo 2.5 mm. lato, inferiore longiore trilobo lobis lateralibus anguste obovatis 4-4.5 mm. longis 3 mm. latis medio longiore obovato 4.5-6 mm. longo apicem versus 4-4.5 mm. lato basi 2 mm. lato inferne puberulo. Stamina 4, filamentis 3·5-4 mm. longis, inferioribus basi 1 mm. incrassatis geniculatis, superioribus c. 3 mm. longis fauce insertis; antherae c. 0.5 mm. longae divaricatae. Ovarium ovoideum; stylus circiter 4 mm. longus, stigma bilamellata lobis suborbicularibus circiter 1 mm. diam. margine fimbriatis. Capsula ovoidea, circiter, 4 mm. longa, 2 mm. diam. calyce longiora.

Transvaal.—Zoutpansberg district: Dongola area, De Klundert, growing in water in a shallow rock pan on a rocky koppie, March, Bruce 66 (flower).

Fig. 6.

This small slender herb was found growing in about $\frac{1}{2}$ -1 in. of water in a shallow rock depression or pan about 4 ft. diam. on a large flat rock slab half-way up a koppie in full sun. There were a number of these plants growing close toegether in little clumps, their long slender roots intertwined and forming a dense mass, which held together what little "soil" there was. The rather fleshy basal leaves of the plants form a dense cluster or rosette and towards the top of the otherwise bare stem were two to four opposite pairs of rather longer leaves. The plants were flowering freely and the white corollas tinged with lilac with an orange spot at the throat, made a colourful display against the bare grey rock. The upper lip of the corolla is entire and forms a little hood under which the stamens are curved, the lower lip is large and 3-lobed, forming a platform from which the lower pair of stamens arise. This pair of stamens has a purple-tinged, knee-like, puberulous appendage at the base.

The genera Craterostigma, Ilysanthes, Torenia and Lindernia are very closely related. Ilysanthes can be separated out in having only two stamens, whereas the other three genera have four stamens. Both Torenia and Craterostigma have a winged or plicate calyx, which is not the case in Lindernia. Our specimen, therefore, definitely belongs to the genus Lindernia, as it has four stamens and the calyx-tube is neither plicate nor winged. A duplicate specimen was sent to Kew and it was there confirmed that it was a new species of Lindernia, though similar in habit to Ilysanthes welwitchii Engl. It is interesting to note that Dr. Pole Evans, who knows the vegetation of the Dongola area very well, has no recollection of having seen this little plant before.

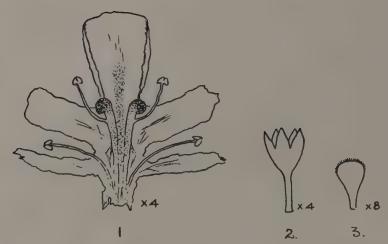


Fig. 6.—Lindernia dongolensis E. A. Bruce. 1—Corolla split down one side, \times 4. 2—Calyx, \times 4. 3—Stigma \times 8.

VERBENACEAE

Vitex patula E. A. Bruce sp. nov. (Verbenaceae); affinis V. madiensi Oliv. et V. amboniensi Gürke, a quibus foliolis sessilibus vel subsessilibus fructu minore, a V. madiensi foliolis minoribus integris, a V. amboniensi foliis 3-foliolatis obovatis obtusis facile distinguenda.

Frutex vel arbor parva, 2-4.5 m. alta; rami patuli, subteretes, cani vel pallidobrunnei, parce pubescentes demum glabrescentes, longitudinaliter fissi; ramuli juniores pallido-flavo-brunnei-tomentosi. Folia opposita, submembranacea nec coriacea, plerumque 3-foliolata rare 4-5-foliolata, longe petiolata; petiolus inflorescentia plus minusve subaequalis, 3.5-6.5 cm. longus, teres nec caniculatus, pubescens vel juniore breviore tomentoso; foliola integra, sessilia vel subsessilia (terminale oboyata 4-7.5 cm. longa 2-3.5 cm. lata lateralibus minoribus obovato-ellipticis 3-6.5 cm. longis 2-3.5 cm, latis) apice rotundata vel rare subacuta, basi cuneata, subtus parce glandulosa et nervis crispo-pubescentibus, supra parce scabridula (juniora densiore pubescentia); nervi laterales utrinsecus 8-11, subtus prominentes plus minusve patuli, nervis tertiariis distinctis inter se paralleleis. Cymae dichotomae, axillares, ramulos apicem versus longe pedunculatae; pedunculi 3-4 cm. longi, dense pubescentes vel subtomentosi; bracteae lineares, 0.8-1.3 cm. longae, pubescentes vel tomentosae. Flores parvi pedicellati, mauvi. Calyx obscure bilabiatus, 5-dentatus, extus tomentosus, intra glabrescens, tubo campanulato c. 2.5 mm. longo, lobis 3 anticis quam 2 posticis majoribus triangularibus acutis 1-1.5 mm. longis. Corollae-tubus anguste infundibuliformis calyce longior, c. 4.5 mm. longus, basi 1.5 mm. fauce 3-5 mm. diam.; lobi inaequales, tomentosi apice rotundati, antico maximo transverse elliptico 3.5 mm. longo 4 mm. lato lateralibus ovatis 2.5 mm. longis 2 mm. latis. Stamina 4, basi corollae inserta, breviter exserta. Ovarium globosum, 1 mm. diam., glabrum, glandulis paucissimis apicem versus obtectum. Fructus niger, nitidus, ovoideus, 1.5 cm. longus, 0.9 cm. diam.

PORTUGUESE EAST AFRICA.—Maputo district: between Santaca and Mazimiama, on sandy soil in open forest, Nov., Gomes e Sousa 3885; near the Transvaal border, growing in sandy soil, small edible berry, Dec., Lamont 27.

Transvaal.—Zoutpansberg district: Kruger National Park, Dzundweni Hill, 11½ miles S.E. of Punda Maria, in lowveld bush on rocky hillside, 1,500 feet, March, Codd 5319, (type); 4½ miles north-east of Punda Maria, in dense bush on low rocky ridge, 1,400 feet, June, Codd 4227; Punda Maria, in sandy veld on koppie, Jan., Lamont 45; 6 miles north-west of Punda Maria, in fairly dense bush, 1,500 feet, April, E. A. Bruce 172; Limpopo, Dec. 1928, Hutchinson 2101; 1½ miles north of P.O. Wylliespoort, 3,000 feet, on steep rocky hillside at foot of north slopes of Zoutpansberg Range, May, Codd 4163; near Wylliespoort, Nov., Pole Evans 1951; Wylliespoort, April, Rodin 4232.

Vitex patula is a summer flowering shrub or small tree with rather straggling, spreading branches, mauve flowers, 3-foliolate, rarely 4-5 foliolate, leaves and small shiny, black, edible fruits. The species generally occurs in fairly dense bush on rocky hillsides, but has also been found on sandy soil in open forest. Its range of distribution, as represented by our material, is from Wylliespoort in the Zoutpansberg range eastwards to Punda Maria and then a long jump south-east to the Maputo district in Portuguese East Africa.

As in other species of *Vitex* there is variation in leaf size, texture and pubescence and in the pubescence of the branchlets in the flowering and fruiting stages; the leaves and young branches particularly are much more densely pubescent in the flowering than in the fruiting stages. According to Pieper's Revision of Vitex in Engler's Bot. Jahrb. (1928), *V. patula* E. A. Bruce, on account of its glabrous, subglobose ovary and more than 3-celled calyx hairs with an elongate unthickened tip, should belong to subgenus *Euvitex*, sect. *Axillares*, subsect. *Cymosae* § *Glandulosae*: *Eutriches*. Material

sent to Kew for comparison was allied to *V. amboniensis* Gürke, a species belonging to §Pilosae, which differs from our species in the 5-foliolate leaves with narrower, acute, more pubescent, petiolulate leaflets, and hairy ovary. Our species is also related to *V. madiensis* Oliv., a very variable species with a number of varieties. It can be distinguished from this in the smaller, sessile, thinner-textured leaflets in which the tertiary veins are finely impressed, reticulate.

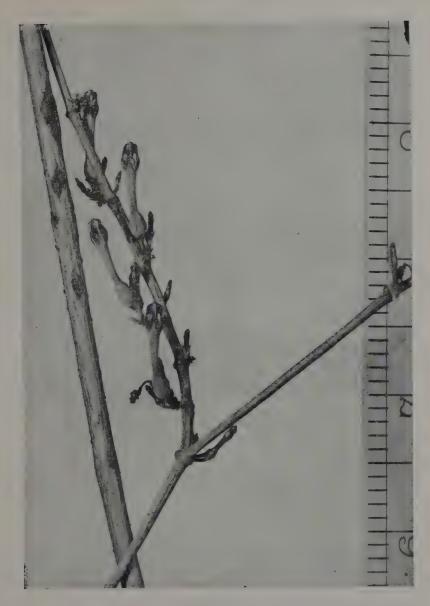


PLATE 1.

Ceropegia decidua E. A. Bruce.
(Photo of type by H. King.)



Commiphora neglecta Verdoorn, 21 miles N.E. of Nylstroom.



PLATE 3.

Encephalartos humilis Verdoorn. Top male cone on plant on Schagen
Hill; below, the whole plant. [Photos by R. A. Dyer.



PLATE 4.

Euphorbia clivicola R. A. Dyer.



PLATE 5.

Euphorbia confinalis R. A. Dyer; type specimen taken from the tree in foreground in the Kruger National Park. [Photo by L. E. Codd.



PLATE 6.
Euphorbia keithii R. A. Dyer, in natural habitat.



Euphorbia keithii R. A. Dyer. Left, small tree in natural habitat on face of krantz near Stegi; right, top of branch in young fruit.

[Photo by H. King.

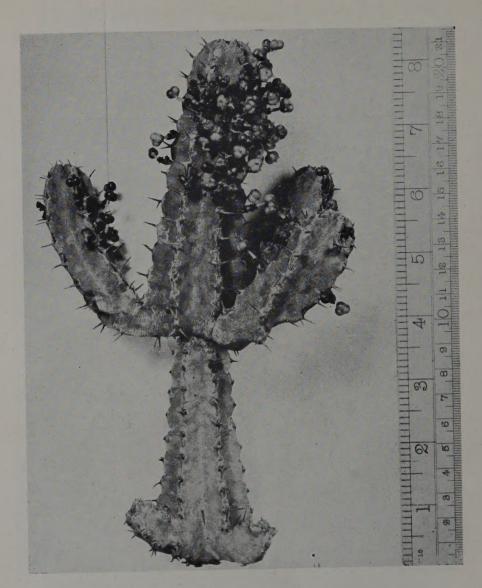


PLATE 8.

Euphorbia keithii R. A. Dyer, fruiting specimen.—(Photo H. King.)

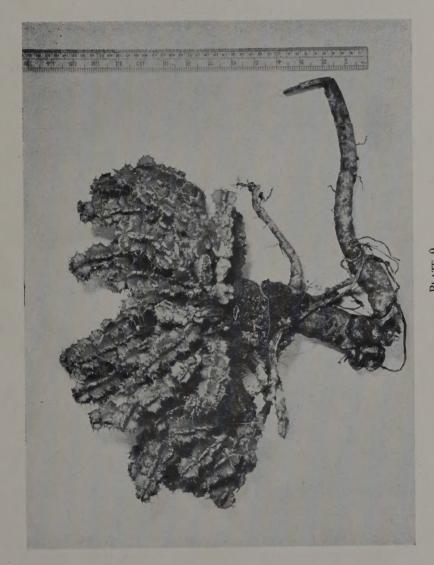


PLATE 9. Euphorbia restricta R. A. Dyer. (Photo H. King.)

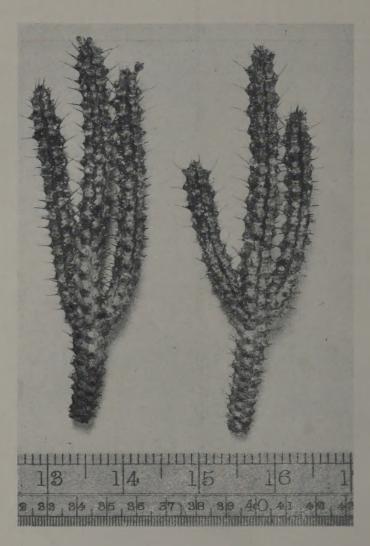


PLATE 10.

Euphorbia unicornis R. A. Dyer. (Photo H. King.)